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An Educational Toolkit for Providers on a Plant-Based Diet and Cardiovascular Disease Prevention

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Abstract

Background: Cardiovascular disease is the leading cause of death globally with risk factors that can be prevented through healthy behavioral and lifestyle habits, such as a diet that is high in healthy plant-based foods. Despite current guideline-based recommendations and evidence that supports a plant-based diet for cardiovascular health, there is a lack of understanding amongst healthcare providers regarding diet as a core aspect of primary and secondary prevention of cardiovascular risk factors.

Purpose: Implementation of an educational toolkit with resources on a plant-based diet and its benefits for cardiovascular health.

Methods: Physicians, nurse practitioners, physician assistants, and registered nurses, located at Healthcare Systems in Florida were selected to participate in this educational toolkit from October 2020 to February 2021, which included consent form, pre-educational survey, PowerPoint presentation, post-educational and follow-up toolkit survey. Descriptive statistics were utilized to describe survey data outcomes.

Results: The educational intervention increased provider self-reported and concept-based knowledge of the plant-based diet by 34 % and 20%, respectively, and encouraged the recommendation of a plant-based diet and use of toolkit resources as patient resources.

Conclusion: An educational toolkit with evidence-based resources may be a useful approach for providing education and resources to healthcare providers on a plant-based diet and cardiovascular health and disease prevention.

Keywords: Plant-based diet (PBD), plant-based foods, Cardiovascular disease (CVD), cardiovascular risk factors, cardiovascular health, mortality

An Educational Toolkit for Providers on a Plant-Based Diet and Cardiovascular Disease Prevention

Introduction

Cardiovascular disease (CVD) is the leading cause of death annually and globally (American Heart Association [AHA], 2017a; Centers for Disease Control and Prevention [CDC], 2017; World Health Organization [WHO], 2017). Many of the significant risk factors for CVD can be prevented and reduced through healthy behavioral and lifestyle habits, particularly a diet that is high in healthy plant-based foods. However, there is lack of understanding amongst healthcare providers regarding the significant impact and benefits of a healthy plant-based diet (PBD) on cardiovascular health. This further creates a lack of discussion between healthcare providers and patients regarding diet as a core aspect of primary and secondary prevention of CVD risk factors, as well as reduction in CVD morbidity and mortality.

The healthcare providers that may benefit from this educational toolkit include physicians, nurse practitioners, physician assistants, and registered nurses, and will be referred to as the "providers" in the rest of this paper. Registered nurses in particular are an integral part of patient assessment, education, and overall care and thus can benefit from learning about plant-based nutrition.

Background

Cardiovascular disease is the number one cause of death in both men and women in the United States and has been so for decades (AHA, 2017a; CDC, 2017; Roth et al., 2017; WHO, 2017). According to the American Heart Association, in 2015, 41.5 percent of the U.S. population had at least one CVD condition, with hypertension, coronary artery disease, and stroke being the leading diseases, respectively. This pattern is predicated to increase to 45

percent of the population by 2035 (AHA, 2017a). Similarly to the heavy health burden, CVD is currently the most costly medical condition in America. Direct and indirect CVD related health care services cost the U.S. an estimated $555 billion in 2016 and is projected to increase annually to reach 1.1 trillion by 2035 (AHA, 2017a). Despite these current and predicted enormous health and economic burdens, our fate does not have to trend this way as CVD is largely preventable. As mentioned in a recent American Heart Association scientific statement: “Multiple lines of research convincingly demonstrate that preventing CVD is economically, socially, and humanly superior to even the best medical treatment of manifest CVD” (AHA, p. 4, 2017b). However, a long-standing and current national issue is that the healthcare system and societal focus is on a disease driven model of acute, or sickness, care rather than preventative care that invests in health. Preventative care services and health promotion are lacking due the to the perceptions that pharmacological treatment is more superior to lifestyle modifications. Furthermore, “failure of providers to promote or follow CVD prevention guidelines has resulted in minimal change or worsening in CVD risk factors over time in many countries and points to a compelling need for a greater emphasis on self-care and health promoting habits” (AHA, p. 5, 2017b).

Significant, yet modifiable, risk factors leading to CVD include hypertension, hyperlipidemia, smoking, diabetes, obesity, poor diet and lack of physical activity. Many of these risk factors can be prevented, reduced, and managed through early, healthy behavioral and lifestyle modifications (AHA, 2017a; AHA, 2017c; CDC, 2017). Healthy lifestyle habits have the potential to reduce cardiovascular disease and major events from 50% - 80%, even in high genetic risk groups, while medications alone may only reduce the risk by 20-30%, suggesting the significant impact healthy lifestyle habits have on cardiovascular health (Khera et al., 2016; Morin et al., 2019). More specifically, our diet, the foods and beverages that we consume, have a

significant impact on the prevention or progression of CVD (AHA, 2017a; AHA, 2017c; Esselstyn Jr. et al., 2014; Morin et al., 2019; Pallazola et al., 2019). A poor diet may be the most significant risk factor contributing to CVD, as it is also a leading cause of obesity and type 2 diabetes (Esselstyn Jr, et al., 2014; Morin et al., 2019; Pallazola et al., 2019). However, in current practice this is not being appropriately addressed and discussed between providers and patients (Kris-Etherton et al., 2014). This may be attributed to multiple factors including limited education and training of providers on nutrition and its significant impact on CVD, how to effectively deliver patient education, lack of time for patient encounters, lack of support in the clinical environment for a preventative-based approach, and extra reimbursement for treatment approach than for prevention (AHA, 2017c; Kris-Etherton et al., 2014; Rahman, 2019).

Current literature shows significant and sustainable prevention and reduction of obesity, type 2 diabetes, hypertension, hyperlipidemia, as well as reduction in cardiovascular mortality and all-cause mortality while consuming a healthy plant-based diet (Arnett et al., 2019; Esselstyn Jr, et al., 2014; Esselstyn, 2007; Song et al., 2016; Tuso, Stoll, & Li, 2015; Willet & Ludwig, 2020; Wright, Wilson, Smith, Duncan, & McHugh, 2017). Interesting to note, coronary artery disease is practically nonexistent in cultures that eat a primarily plant-based diet (Esseltyn, 2001). Furthermore, research suggest that a PBD is low-risk intervention and may have similar to superior outcomes for the prevention and reversal of cardiovascular risk factors when compared to medications and cardiac procedures (Esselstyn, 2007; Tuso, 2015; Song et al., 2016).

A healthy PBD primarily consists of consuming nutrient-dense, whole-foods including vegetables, fruits, whole grains, legumes, nuts and seeds, water, unsweetened plant-based milks, tea, coffee, and limited amounts of natural sweeteners, non-hydrogenated vegetable oils while avoiding processed foods, fried foods, animal-based foods, coconut oil, refined grains, artificial

and refined sugars, excess sodium, and sugar sweetened beverages (i.e. soda, fruit juices, energy and sport drinks).

Problem Statement

Cardiovascular disease is strongly associated with modifiable risk factors that are likely preventable through early promotion of healthy lifestyle habits. The high prevalence of CVD may also be attributed to providers' lack of understanding and/or lack of patient education regarding health promotion behaviors that can prevent or reduce these risk factors, such as the importance of a healthy diet on the prevention or progression of CVD.

To help address this issue, an evidence-based educational toolkit for providers on the health benefits of a plant-based diet is being proposed. The purpose of this educational toolkit is to give providers evidence-based research and resources on a healthy plant-based diet emphasizing the benefits on preventing CVD risk factors and increasing provider knowledge on this topic.

Organizational "Gap" Analysis

Currently, almost half of the American population is chronically sick with cardiovascular conditions that could be prevented or reduced by healthy lifestyle changes. The U.S. health care system needs to shift towards a more preventative approach with improvement in proper nutrition education for providers and patients. There needs to be more motivation for providers to offer patients early, in-depth education on healthy lifestyle habits to prevent disease, rather than focusing on treating illness and injury when it is advanced (AHA, 2017a; AHA, 2017c; Kris-Etherton et al., 2014; Paterick, Patel, Tajik, & Chandrasekaran, 2017). Patients often seek guidance from their healthcare providers for proper nutrition support. However, many providers are not able to offer meaningful guidance due to the lack of knowledge regarding a healthy PBD

and its benefits for preventing or reducing CVD risk factors. Furthermore, providers may be spending little to no time educating patients on a PBD, nor offering supplemental educational material for patients to take home (Paterick, et al., 2017; Rahman, 2019). Overall, there is a need for improvement in education and resources on a healthy PBD and its benefits for cardiovascular health for providers and patients to establish an early preventative approach to prevent disease.

What has been described above has been noted at multiple clinical sites and a continuing theme in healthcare overall. A clinical site in particular, Memorial Healthcare Systems at Memorial Regional Hospital in Hollywood, Florida, has providers who give patients good quality of care for medical conditions and instructions to follow appropriate treatment guidelines. However, there is lack of provider knowledge of a healthy PBD and its positive association with cardiovascular health and cardiovascular disease prevention, as well as time spent educating patients on healthy diet modifications in general. See Appendix A, Figure 1 for the Organization Letter of Support from Memorial Healthcare Systems.

The Review of Literature

A search of the literature was conducted using the online databases: PubMed, Cumulative Index of Nursing and Allied Health (CINAHL), RefWorks, University of Massachusetts Library, and Google scholar. The following Medical Subject Headings (MeSH) were used: *'plant-based', 'plant-based diet', 'vegan diet', 'plant-based nutrition', 'cardiovascular disease', 'coronary artery disease', 'cardiovascular health', "cardiovascular mortality', 'obesity', 'Type 2 Diabetes', 'hypertension', 'hyperlipidemia', 'health promotion', 'preventative medicine', 'nutrition therapy', 'education', 'plant-based education', 'ACC', 'AHA'*. Search parameters included: literature in English language only, evidence-based literature, randomized control trails, experimental studies, cohort studies, quality improvement projects, clinical guidelines, and

expert opinion. Exclusion criteria included journal articles and/or research studies based solely on vegetarian diet, DASH diet, and Mediterranean diet, meta-analyses, editorials, and abstracts. Twenty-seven articles from 2006-2020 were selected from the 125 yielded articles based on relevance to topic and application to the aims of the project. The selected articles highlight findings on the prevention and reduction of certain CVD risk factors utilizing a plant-based diet, as well as CVD incidence, mortality, and all-cause mortality. The selected 27 articles resulted in three randomized control trials (RCT), five non-RCT experimental study, four non-RCT experimental longitudinal cohort studies, one mixed methods study, two clinical practice guidelines, one high-quality systematic review, ten expert opinion based on research evidence, and one quality improvement study. The John Hopkins Nursing Evidence-Based Practice (JHNEPB) Evidence Level and Quality Guide was used to evaluate the literature mentioned above and is in Appendix A, Table 1.

Clinical Practice Guidelines & Expert Opinion. The American College of Cardiology (ACC) and American Heart Association (AHA) 2019 clinical practice guideline on primary prevention of cardiovascular disease strongly recommends a diet that is high in plant-based foods such as vegetables, fruits, legumes, nuts and seeds, whole grains, and lean protein, to reduce atherosclerotic cardiovascular risk factors (Arnett et al., 2019). Recommendations are based on quality studies in which findings suggests diets higher in plant-based food consumption have been consistently associated with reduction in all-cause mortality compared to other diets. In one study referenced, post-hoc analysis showed higher consumption of plant-based foods, compared to animal proteins, was associated with a significant reduction in mortality of 41% (PREDIMED study conducted by Martínez-González et al, 2014). Other referenced studies have findings that

show lower cardiovascular mortality rates when plant protein is substituted for animal protein of meat and/or dairy (Song et al., 2016; Tharrey et al., 2018; Willet & Ludwig, 2020).

In the 2017 AHA scientific statement on "Self-Care for the Prevention and Management of Cardiovascular Disease and Stroke", experts highlight data from a hypothetical model that was created to compare number of deaths in correlation to CVD prevention versus treatment. The hypothetical model included an age range of "30 to 84 years with risk-factor levels, event rates, current behavior patterns, levels of treatment, and mortality rates that resembled the U.S. population" (AHA, p. 4, 2017c). In the model population, 44% of all deaths were due to cardiovascular disease, in which it was estimated that 33% of these deaths could have been prevented or delayed with proper management of CVD risk factors. Furthermore, only an estimated 8% of deaths would have been prevented from proper treatment during an acute CVD event. The data from this hypothetical model represents the importance of CVD prevention. Experts in this AHA statement also review the current lifestyle behaviors that promote positive cardiovascular health, in which diet is a key component. Experts recommend a nutrient-dense diet that is high in plant-based foods. While the two most commonly recommended heart-healthy diets to prevent or reduce CVD and risk factors are the Dietary Approaches to Stop Hypertension (DASH) and Mediterranean-style diets, experts mention that a vegan diet that contains all essential amino acids, vitamins, and minerals can easily meet these recommendations (AHA, 2017c).

CVD Risk Factors. Findings from multiple research studies, in which a select few will be discussed below, show prevention, reduction, and potential reversal of cardiovascular risk factors, specifically for diabetes, hypertension, hyperlipidemia, and obesity, when consuming a healthy, nutrient-dense PBD (Barnard et al., 2006; Belardo & Klatt, 2020; Esselstyn Jr, et al.,

2014; Frattaroli et al., 2008; Jensen et al., 2014; Kim et al., 2019; Morin et al., 2019; Pallazola et al., 2019; Satija & Hu, 2018; Song et al., 2016; Tharrey et al., 2018; Willet & Ludwig, 2020; Wright et al., 2017).

Diabetes. Diets higher in plant-based foods are associated with decreased risk for and potential reversal of type 2 diabetes through improved glycemic control, hemoglobin A1C (HbA1C), and insulin sensitivity, as well as a preventing or reducing contributing factors including insulin resistance, obesity, hyperlipidemia, hypertension, and elevated IGF-1 levels. Research has shown this can be achieved through a low-fat plant-based diet with optimal weight and medical management. Furthermore, individuals with a history of diabetes have an increased risk for all-cause mortality with a diet higher in animal-based proteins versus a decreased risk with a diet higher in plant-based proteins (Barnard et al., 2006; Morin et al., 2019; Song et al., 2016; Wright et al., 2017).

In one RCT of type 2 diabetics, HbA1C was reduced by 1.23 points in the low-fat vegan diet group compared to 0.38 points in the 2003 American Diabetic Association (ADA) diet group ($p = 0.01$). To mention, the low-fat vegan diet was defined as an unrestricted amount of plant foods that were lower in glycemic including vegetables, fruits, whole grains, and legumes while avoiding animal products and added fats (Barnard et al., 2006). The vegan diet group had a 43% reduction in their diabetes medication compared to 26% reduction in the ADA group. Furthermore, there was greater dietary adherence to the vegan diet compared to the ADA diet, with researchers suggesting it may be related to a wider variety of food options and not having to restrict calories or portion sizes (Barnard et al., 2006). In another RCT that included type 2 diabetics, HbA1C was significantly reduced at six and 12 months, with two participants no longer meeting diagnostic criteria for type 2 diabetes, when consuming a low-fat plant-based diet

(Wright et al., 2017). The low-fat plant-based diet was defined as unrestricted amount of plant foods that included vegetables, fruits, whole grains, and legumes while avoiding animal products and oils (i.e. olive oil and coconut oil) and minimizing sugar, salt, and caffeinated beverages. Plant foods high in fat, such as avocado and nuts, as well as highly processed foods, were discouraged (Wright et al., 2017).

Hypertension. A healthy PBD, which is typically high in vegetables, fruits, potassium, calcium, magnesium, and fiber while low in sodium, saturated fat, trans saturated fat, and total fat, is associated with lower blood pressure, as well as effectively lowering blood pressure in hypertensive individuals (Casey Jr. et al., 2019; Elliott et al., 2006, Morin et al., 2019; Whelton et al., 2018).

In the INTERMAP study, findings revealed an inverse relationship between plant-based protein intake and blood pressure, with a significant reduction in systolic and diastolic blood pressure (Elliott et al., 2006). High associations were found between plant-based protein intake and dietary fiber and magnesium intake, and between animal-based protein and cholesterol intake. Interestingly, diets higher in plant-based protein and were found to have a significant difference in the amino acid content when compared to diets higher in animal-based proteins (Elliott et al., 2006). Individuals consuming a diet high in plant-based proteins had greater intake of glutamic acid, cystine, proline, phenylalanine, and serine. They consumed less of the other 13 amino acids, which appeared to be a greater intake in individuals who consumed a diet high in animal-based protein. Thus, an association may exist between plant-based protein intake and lower blood pressure through mechanisms of certain amino acids, coupled by higher magnesium intake (Chan, et al.., 2016; Elliott et al., 2006).

Hyperlipidemia. Healthy, nutrient-dense plant foods are naturally low in fat and may contain high monounsaturated or polyunsaturated fat, and high dietary fiber, which is associated with lowering cholesterol, as well as improving blood lipids and cardiovascular health (Satija & Hu, 2018). Furthermore, plant-based foods typically contain none to minimal trans or saturated fats, which are positively associated with cardiovascular disease and are typically found in meats, dairy, or processed foods (AHA, 2017a; AHA, 2017b; AHA, 2017c; Carson et al., 2020). Based on the findings from the studies mentioned below, a healthy PBD is associated with a greater and sustainable reduction in total cholesterol and low-density lipoproteins (LDL) cholesterol (Barnard et al., 2006; Morin et al., 2019; Wright et al., 2017).

In a 12- week educational program, mixed-methods study on a whole food, plant-based diet that included adults with at least one CVD risk factors, Morin et al. (2019) noted significant improvement in participants' total cholesterol, LDL, and high-density lipoproteins (HDL) cholesterol ($p<0.001$). A 30% reduction in serum LDL cholesterol was achieved in all participants, and in post-hoc analysis controlling for cholesterol-reducing medications these participants achieved a 36% reduction in LDL ($p<0.001$).

In an RCT, previously mentioned, type 2 diabetics on a low-fat vegan diet had a 21.2% reduction in LDL cholesterol at five months compared to a 10.7% reduction in LDL in the group consuming the ADA diet (Barnard et al., 2006). In another RCT, also previously mentioned, that included individuals with CVD risk factors or a diagnosis of ischemic heart disease and/or type 2 diabetes, participants consuming a low-fat plant-based diet had significant reductions in total cholesterol at three, six and 12 months ($p<0.001$, $p<0.01$, $p= 0.05$, respectively), and LDL cholesterol ($p<0.0001$), compared to the control group which showed a significant reduction of total cholesterol at three months ($p=0.03$) but at no other measure point. Of note, in the low-fat

plant-based diet group, a significant reduction in HDL cholesterol was seen from baseline to six months (Wright et al., 2017).

Body Weight. As mentioned earlier, a PBD is typically lower in total and/or saturated fat and calories while high in dietary fiber, which promotes weight loss and long-term weight management. Specifically, a diet high in fiber is likely to promote earlier satiety, delay gastric emptying and improve nutrient absorption, as well as improve regulation of post-prandial insulin and glycemic responses (Satija & Hu, 2018). Furthermore, research supports a PBD promoting weight loss and reduction in body mass index (BMI) that are independent of exercise and calorie restriction (Barnard et al., 2006; Morin et al., 2019; Tharrey et al., 2018; Tuso et al., 2013; Wright et al., 2017).

Findings from studies, mentioned above (Barnard et al, 2006; Wright et al., 2017; Morin et al., 2019, respectively), showed individuals who consumed a low-fat vegan or a low-fat plant-based diet had greater reductions in body weight and BMI. Specifically, a body weight reduction of 6.5 kg in the vegan diet group compared to 3.1 kg in the ADA group at five months (Barnard et al, 2006); a significant reduction in BMI and weight ($p<0.0001$) at three, six, and 12 months (Wright et al., 2017); and a significant reduction in weight, BMI, and waist circumference ($p<0.05$) at 12-weeks (Morin et al., 2019).

Plant-based Diet Effects on Mortality. Several longitudinal studies discussed below evaluated the effects of diet, specifically animal-based protein and plant-based protein, on CVD incidence, cardiovascular mortality and all-cause mortality (Kim et al., 2019; Satija et al., 2017; Song et al., 2016; Tharrey et al., 2018). Two of the studies in particular (Kim et al., 2019; Satija et al., 2017) evaluated healthful plant-based foods and unhealthful plant-based foods and its association with risk for coronary heart disease, CVD mortality, and all-cause mortality. Overall,

findings support a decreased risk for CVD incidence, cardiovascular mortality and all-cause mortality while consuming a plant-based diet, compared to an increased risk while consuming an animal-based diet, particularly high in processed meats and red meat. Additionally, a healthy PBD when compared to an unhealthy PBD diet favors a lower risk for CVD and all-cause mortality.

In a community-based longitudinal cohort study conducted in the United States from 1987-2017, 12,168 middle-aged men and women with no baseline CVD, were evaluated to determine if a PBD was associated with a decreased risk for CVD incident and mortality, as well as all-cause mortality (Kim et al., 2019). Researchers wanted to evaluate whether outcomes differed between consumption of a healthful plant-based foods, unhealthful plant-based foods, or provegetarian foods. Healthful plant-based foods included vegetables, whole grains, fruits, nuts, legumes, tea, and coffee. Unhealthful plant-based foods included refined carbohydrates and sugars, such as fruits juices, refined grains, potatoes, sugar-sweetened beverages, and desserts. Provegetarian foods included plant-based foods and animal-based foods (Kim et al., 2019).

Findings showed that consuming a diet higher in plant-based foods was associated with decreased risk of a CVD incident, CVD mortality, and all-cause mortality by 16%, 32%, and up to 25% respectively (Kim et al., 2019). Additionally, a diet higher in healthful plant-based foods was associated with a 19% and 11% lower risk of CVD mortality and all-cause mortality, respectively, but no association found for lower risk of CVD incident. Diets higher in unhealthful plant-based foods were associated with higher risk for type 2 diabetes and coronary heart disease, while diets with higher intakes of animal-based foods, specifically eggs, processed meat, and red meat were associated with a higher risk of CVD incident, mortality, and all-cause mortality. (Kim et al., 2019).

A similar study, conducted by Satija et al. (2017), evaluated risk for coronary heart disease (CHD) and its association with a healthful PBD, unhealthful PBD, and animal-based diet in three cohorts: 73,710 women in the Nurses' Health Study (NHS) (1984–2012), 92,329 women in NHS2 (1991–2013), and 43,259 men in Health Professionals Follow-up Study (1986– 2012), with all participants free of chronic diseases at baseline. Healthful plant foods were defined as fruits, vegetables, whole grains, nuts, legumes, vegetable oil, tea and coffee. Unhealthful plant foods were defined as refined grains, potatoes (baked or mashed, French fries, chips), fruit juices, sugar-sweetened beverages (sodas), sweets and desserts. Animal-based foods included meats (including processed and unprocessed), dairy (including skim and whole-fat milks), and eggs. Findings in all three cohorts showed a stronger inverse association between a healthful PBD and CHD incidence, and a positive association between an unhealthful PBD and animal-based diet and CHD incidence. In a separate analysis within the study, similar associations were found with type 2 diabetes incidence and the three food groups. Findings support a decreased risk for CHD even with a small decrease intake in animal-based foods combined with an increased intake of healthy plant foods (Satija et al., 2017).

In the Adventist Health Study 2, conducted between 2002-2007 with a nine-year follow-up period, 81,337 males and females from the U.S. and Canada were evaluated to determine an association between dietary animal-based protein and plant-based protein intake and CVD mortality. Findings showed a significant (61%) increase in cardiovascular mortality risk with meat consumption, while consumption of seeds and nuts as plant protein showed a 40% decrease in cardiovascular mortality risk. Specifically, in adults aged 25-44, there was a strong association for CVD mortality with a higher risk with meat protein consumption. There was an almost three-times lower risk with nuts and seeds protein consumption.

An interesting finding to mention, as also seen in the INTERMAP study (Elliott et al., 2006), researchers noted an association between the amino acid composition of specific foods and CVD health. Specifically, consumption of glutamic acid intake, found predominately in plants, and L-arginine, a precursor to nitric oxide found in high contents in nuts, were associated with lower blood pressure and positive vascular health. Furthermore, glycine, found in higher amounts in meats, may be associated with a direct adverse relationship between meat and blood pressure (Stamler et al., 2013; Tharrey et al., 2018). Overall, findings suggest an association between protein sources and CVD mortality, favoring higher intake of plant sources, specifically seeds and nuts, and lower intakes of meat sources to prevent CVD mortality (Tharrey et al., 2018).

In the Nurses' Health Study (1980–2012) and the Health Professionals Follow-up Study (1986–2012), 131, 342 U.S. health care professionals, were evaluated to determine the relationship of animal and plant protein intake with risk of cardiovascular mortality and all-cause mortality through assessing hazard ratio (HR) of mortality (Song et al., 2016). Higher intake of animal-based protein, particularly processed and unprocessed red meats, high-fat dairy intake, and eggs, were associated with increased cardiovascular mortality (HR, 1.08; $p = .04$). No association was found for fish or poultry for total mortality. Higher intake of plant protein was associated with the lowest all-cause mortality (HR, 0.90; $p < .001$) and cardiovascular mortality (HR, 0.88 $p = .007$), particularly favored participants with at least one identified lifestyle risk factor for CVD. Furthermore, the HR for all-cause mortality was reduced to 0.66, from a range of 0.81- 0.88, when an equal amount of protein from all animal sources was replaced by 3% of energy from plant protein. Interestingly, participants that consumed higher animal protein intake exhibited more negative health behaviors, while those that consumed higher plant proteins

exhibited more positive health behaviors and diets higher in healthy plant foods (Song et al., 2016).

Secondary Outcomes. A PBD is associated with improvement in reported quality of life, adherence, and sustainability, as well as reduction in medication usage and prevention of major cardiac procedures (Barnard et al., 2016; Morin et al., 2019; Frattaroli, et al., 2008; Wright et al., 2017).

Quality of Life. While often the primary focus is on prevention and reduction of CVD risk factors and cardiovascular mortality, patients' quality of life is just as equally as important to consider. In Wright et al. (2017), individuals who consumed a low-fat plant-based diet showed significant improvements in reported quality of life, general and nutritional self-efficacy, self-esteem, as well as reduction in the use of prescription medications.

In a U.S. intensive lifestyle modification intervention program study from 1998-2006, Frattaroli et al. (2008) evaluated changes in angina pectoris, CVD risk factors, quality of life, and lifestyle behaviors in 1,152 male and female patients with stable coronary artery disease who followed a PBD with moderate exercise and stress management techniques. At baseline, prior to starting the PBD, 799 patients had no angina, 90 had mild angina, and 158 had limiting angina. At week 12, 186 patients with previous mild or limiting angina became free from angina, while an additional 23 patients reduced their angina from limiting to mild.

All patients significantly improved in all measured CVD risk factors, except for HDL cholesterol, which slightly decreased (Frattaroli et al., 2008). Improvements in exercise capacity, depression, and quality of life was most significant in patients who reported no angina. An interesting point to mention, is that there were patients eligible for revascularization, but instead decided to undergo this study's intervention which resulted in 80% of these patients being able to

avoid invasive cardiac procedures for greater than three years by following the study's suggested lifestyle changes. Furthermore, the researchers suggest that the amount of decrease in angina achieved in this study is similar to that achieved by revascularization (Frattaroli, et al., 2008).

Adherence & Sustainability. A healthy plant-based diet contains a variety of nutrient dense, high fiber foods that are typically lower in calories and high in healthy fats, which allows for greater intake and slower digestion throughout the day. Several studies indicate a PBD is associated with greater dietary adherence and sustainability compared to other diets, which may be attributed to unrestricted calories and portion sizes (Barnard et al., 2016; Morin et al., 2019; Wright et al., 2017). Adherence and sustainability may be further augmented with implementation of a nutrition educational program that prioritizes healthy plant-based foods. Nutrition programs that include education on a PBD and its health benefits, group sessions, plant-based recipes, and resources on access to plant-based foods, appear to be most successful in guiding patients towards adopting and maintaining a PBD, as well as preventing negative cardiovascular outcomes (Barnard et al., 2016; Frattaroli, et al., 2008; Morin et al., 2019; Rahman, 2019; Wright et al., 2017).

Additional Health Benefits of Plant Foods. A balanced and varied diet of nutrient-dense plant-based foods contains the necessary vitamins, minerals, and essential amino acids. In addition, nutrient-dense plant foods are typically lower in calories, which can help to maintain a healthy weight, blood pressure, and cholesterol level (AHA, n.d.; AHA, 2017b; AHA, 2017c; AHA, 2017d; Esselstyn Jr, et al., 2014; Satija & Hu, 2018). Recommendations to include certain supplements is discussed below in the section 'Essential Nutrients'.

Plant foods, particularly vegetables, vegetable oils, fruits, whole grains, nuts, tea, coffee, and cocoa, are high in polyphenols, which are known to promote cardiovascular health through

several mechanism (Satija & Hu, 2018). Polyphenols are known to have antioxidative benefits, especially high in Vitamin C and E and beta-carotene, by neutralizing free oxygen and regulating nitric oxide production, as well as protecting against oxidative stress. Polyphenols are rich in potassium and magnesium, which are associated with positive cardiovascular health benefits (Satija & Hu, 2018). Potassium is associated with reducing blood pressure and stroke risk through improved endothelial function and vascular homeostasis. Magnesium is associated with beneficial effects on glucose metabolism and insulin sensitivity, and is known for its anti-inflammatory, antiarrhythmic, and vasodilatory effects (Satija & Hu, 2018; Tuso et al., 2015). Furthermore, "polyphenols might also contribute to improved cardiovascular health through their roles in inhibiting platelet aggregation, reducing vascular inflammation, modulating apoptotic processes, limiting LDL oxidation, and improving lipid profile" (Satija & Hu, p. 440, 2018).

Essential Nutrients. There are key essential nutrients that promote health and should be emphasized when planning for a PBD, which include Vitamin B12, vitamin D, iron, calcium, iodine, essential fatty amino acid Omega-3, protein and amino acids. Most of the nutrients have been argued to be mainly found in animal-based proteins or that there may be lower amounts found in plant-based foods, however they can be adequately attained through a healthy PBD.

Vitamins B12, D, and calcium can be attained through consumption of plant-based fortified foods (plant-based milk or cereals) and/or use of a supplement. Nutritional yeast is also a reliable source of vitamin B12. Since it may be difficult to achieve the daily recommended intake of vitamin B12 through plant fortified food sources, a B12 supplement is recommended to prevent B12 deficiency. Vitamin D can also be attained through 10-15 minutes of unprotected sun exposure, unless contraindicated. Calcium can also be attained through consumption of dark green leafy vegetables, nuts, and legumes. Iron-rich plant foods include beans, nuts and seeds,

and dark leafy green vegetables. Plant foods contain non-heme iron, which is not as bioavailable as heme iron found in meat, and thus it is recommended to pair with Vitamin C-rich foods or supplement to increase absorption. Iodine, important for thyroid function, can be attained through consumption of seaweed (kelp), iodized salt, or a supplement (Belardo & Klatt, 2020). Omega-3 can be attained through consumption of flax seeds, chai seeds, walnuts, and certain vegetables oils (ALA), and/or by an algae oil-based Omega-3 (EPA + DHA) supplement (Kris-Etherton et al., 2002).

It is preferred to obtain nutrients from diet, however, if unable to obtain through diet alone then supplements may be recommended and may be a more affordable choice than purchasing animal-based proteins to attain these nutrients, and are associated with less adverse health risks (Belardo & Klatt, 2020; Esselstyn Jr, et al., 2014; National Institutes of Health, 2020; Satija & Hu, 2018; Willett & Ludwig 2020).

Plant-based foods that are rich in protein include whole grains, beans, legumes, nuts, seeds, nutritional yeast, and soy. For example, "a one-cup serving of cooked beans, peas, lentils, or tofu can replace a two-ounce serving of meat, poultry or fish, and two-ounces of nut butter counts as 1-ounce of meat" (AHA, n.d.; AHA, 2017b). There has been no literature found that supports plant foods lack the required daily intake of protein or essential amino acids, nor that consuming animal-based proteins is necessary to achieve this. However, an important consideration is that most plant foods are considered incomplete proteins, meaning that typically one single plant food does not contain all of the nine essential amino acids, with exception to some plant foods (i.e. quinoa, buckwheat, soy). Thus, eating a variety of healthy plant foods throughout the day will ensure getting the nine essential amino acids. Furthermore, based on the

supporting literature, healthy plant-based proteins are associated with positive health outcomes (Belardo & Klatt, 2020; AHA, n.d.; AHA, 2017b).

Nutrient Health Concerns. Foods that contain high levels of saturated fat, trans saturated fat, cholesterol, and sodium are well-established contributing factors to CVD, and can be found in processed meats, red meat, full-fat dairy, and coconut oil (AHA, n.d.; AHA, 2017a; AHA, 2017b; AHA, 2017c; Willett & Ludwig, 2020).

Trimethylamine-N-oxide (TMAO), a gut bacteria byproduct from digestion of dietary nutrients choline and L- carnitine, and may be a potential nontraditional, risk factor for CVD by contributing to atherosclerosis through pro-inflammatory and pro-thrombotic mechanisms, as well as promoting cholesterol and sterol metabolism (Koeth et al., 2018; Satija & Hu, 2018; Tuso et al., 2015). Choline and L-carnitine is more abundant in animal products such as red meat, poultry, fish, eggs, and dairy, but are also found at lower levels in certain plant foods. Several studies findings show an association between chronic red meat consumption and high levels of TMAO with a 2-fold increased risk for major cardiovascular events (heart attacks and strokes) compared to diets higher in plant foods. However, there is a need for further investigation on the interactions between TMAO, the gut microbiome, and its role in CVD (Esselstyn Jr, et al., 2014; Koeth et al., 2018; Satija & Hu, 2018; Tuso et al., 2015; Zhu et al., 2016).

Other nutrients that are potential risk factors for CVD include heme iron, added sodium or potassium nitrates and nitrites, which may increase the risk of CVD through oxidation of LDL cholesterol, raising blood pressure, and impairing endothelial and insulin function (Hunnicutt, He, & Xun, 2014; Satija & Hu, 2018). These are commonly found in meat, particularly processed meats and red meat.

Clarifications & Future Research. To note, there is conflicting evidence in the literature regarding potato consumption and its association with cardiovascular disease, in which future studies may consider further evaluating the amount and type of potato (i.e. boiled versus fried) consumed (Kim et al., 2019). Furthermore, there is conflicting evidence amongst literature regarding plant-based foods that are considered healthy, but may need to be minimized due to high caloric and fat content, including healthy oils (olive oil) and fats (avocado, nuts). However, this may be more aimed at individuals who desire or need to reduce body weight, as current research shows no association between these foods and CVD risk (Arnett et al., 2019; Barnard et al., 2006; Esselstyn Jr, et al., 2014; Wright et al., 2017). In addition, it may be beneficial for future studies to further evaluate the quantity and quality of macro and micro nutrients in plant foods (healthful versus less healthful) in an overall plant-based diet, excluding all animal based foods, to determine its association with cardiovascular disease risk factors, CVD mortality, all-cause mortality (Kim et al., 2019; Satija et al., 2017).

Important to mention, several studies' findings reported a reduction in HDL cholesterol in association with consumption of a PBD. While there may be a need for more research, a reduction in HDL cholesterol with a concurrent reduction in total and LDL cholesterol, and other CVD risk factors, may not be harmful for cardiovascular health (Frattaroli, et al., 2008; Kent et al., 2013; Morin et al., 2019; Wright et al., 2017).

Evidence-based Practice Intervention

The findings within the literature support a healthy PBD for the prevention, reduction, and potential reversal of cardiovascular risk factors, as well as decreased risk for CVD incidence, CVD mortality and all-cause mortality. A PBD is also associated with improvements in quality of life, and dietary adherence and sustainability. A diet that is richer in nutrient-dense, unprocessed,

and unrefined plant-foods appear to have the most significant positive impacts on cardiovascular health. Education programs that include PBD education and its health benefits, group sessions, plant-based recipes, and information on access to plant-based foods appear to be successful in guiding patients towards adopting and maintaining a PBD. Furthermore, a plant-based diet is a low-risk intervention that can lead to a sustainable, healthy lifestyle that may reduce the amount of prescriptions and prevent major cardiac procedures.

This project implemented an evidence-based educational toolkit on a PBD for providers to increase understanding of the cardiovascular benefits from a PBD and to serve as a resource to help guide patient education and empowerment for improved health.

Theoretical Framework

Pender's Health Promotion Model will be utilized to guide this project's intervention. The major strength of this model is the focus on health promotion and disease prevention, with education and interventions primarily implemented by nurses (Gonzalo, 2019; Nursing Theory, 2016). This associates with the aims of this DNP project with the intervention, an educational toolkit, being provided by this writer and serving as a tool for health promotion through education on a lifestyle modification, such as consuming a healthy PBD, to prevent and reduce risk factors for cardiovascular disease. Educating providers and increasing their knowledge of a healthy PBD can aid in health promotion and disease prevention through improved patient education and partnerships, which may lead to improvements in patient self-care behaviors, self-efficacy, and health outcomes (AHA, 2017c; Kris-Etherton et al., 2014; Paterick, et al., 2017). See Appendix B, Figure 1 for a visual representation of Pender's Health Promotion model.

Methods

This educational intervention utilized a web-based educational toolkit for healthcare providers to aid providers with evidence-based research and resources on a plant-based diet and its benefits for cardiovascular health and disease prevention. The toolkit also included patient education resources for patient care. Project objectives were collected and analyzed by surveys.

Project Objectives

Objective #1: Development of a web-based evidence-based toolkit on a plant-based diet and its benefits for cardiovascular health and disease prevention. This was achieved by creating a website through Squarespace that presented evidence-based research and resources for providers on plant-based diets and cardiovascular disease prevention.

Objective #2: Assessment of provider knowledge of a PBD and its association with cardiovascular health and disease prevention. Knowledge was assessed through questions that addressed provider self-report and actual content-based knowledge. This was achieved by analysis of data from specific questions on the surveys to determine if there was a change in knowledge from before (pre-) to after (post-) viewing the educational PowerPoint presentation and resources.

Objective #3: Assessment of provider implementation of PBD education and utilization of the toolkit resources into their practice. This was achieved by analysis of data related to specific questions across all three surveys.

Objective #4: Assessment of provider satisfaction with the educational toolkit. This was achieved by analysis of data from the post-educational survey.

Objective #5: Assessment of barriers that may interfere with patient education on primary prevention of CVD, including nutrition.

Project Site and Population

The participating project site was a Healthcare Systems in Florida. The invitation to participate was emailed to twenty providers, including physicians, nurse practitioners, physician assistants, and registered nurses, in a variety of practice settings, including: primary care, internal medicine, cardiology, and neurology. The purpose for including providers from different professions and specialties was to maximize the knowledge of the cardiovascular health benefits from a PBD across the medical field.

Implementation

The pre-intervention phase took place from May 2020 to September 2020 and included the following: selection of project site and population, creation of the educational toolkit, project proposal approval, and collection of providers' emails.

The DNP student sought out a project site that included providers who were in need for the education and resources on a PBD and cardiovascular health promotion and disease prevention.

The educational toolkit was developed by the DNP student during this time, including: website development, PowerPoint presentation, and surveys. The educational toolkit was created as a website using the web-based platform Squarespace. The toolkit included the consent form, PowerPoint presentation, pre-educational and post-educational surveys, and professional resources for providers and patients.

The PowerPoint presentation consisted of a 60-minute PowerPoint slide and voice-recording presentation that outlined the following: Project Objectives, CVD Burden, Gaps in Healthcare, Plant Based Diet and Essential Nutrients, Nutrients of Concern, Review of Literature (i.e. clinical practice guidelines, research studies), Clarifications and Future Research, and

References. See Appendix C for an outline of the toolkit and the website link for the educational toolkit.

A total of three surveys were created using SurveyMonkey and included a pre-educational survey, post-educational survey, and a follow-up toolkit survey. The pre-educational survey was designed to be taken prior to viewing the educational PowerPoint presentation and/or toolkit resources. The survey consisted of a total of ten questions including two demographic questions that assessed for provider profession (i.e. MD) and specialty (i.e. Primary care), and eight questions that assessed for provider knowledge prior to viewing the educational PowerPoint presentation and toolkit resources. Knowledge was assessed through questions that addressed provider self-report and actual content-based knowledge.

The post-educational survey was designed to be taken after viewing the educational PowerPoint presentation and toolkit resources. The survey consisted of a total of ten questions, including five questions that assessed for provider knowledge after reviewing the PowerPoint presentation and resources, four questions that assessed for provider likelihood to implement PBD education and/or toolkit resources into practice, and one question that assessed for overall satisfaction of the educational toolkit.

The follow-up toolkit survey was designed to be taken at least a month after completion of PowerPoint presentation and having access to the toolkit's resources. The survey consisted of a total of ten questions, including one that assessed for provider self-reported knowledge, seven that assessed for provider implementation of PBD education into their practice and utilization of educational toolkit and resources, one that assessed for barriers to patient education, and one that assessed for interest in continued plant-based diet education. See Appendix D for copies of the online surveys.

Following proposal approval, providers' emails were collected in September 2020 prior to the anticipated launch of the educational toolkit in October 2020.

The intervention phase took place from October 2020 to February 2021 and was fully completed on February 8, 2021. The intervention phase began with the delivery of the project details and educational toolkit website link to twenty providers' emails on October 8, 2020. See Appendix E for the email to participants. A total of eleven providers agreed to participate in the project per the consent form.

Part 1. This phase of the educational intervention was from October 8, 2020 to December 31, 2020 and included the completion of the following components of the educational toolkit in this order: consent form, pre-educational survey, PowerPoint presentation, and post-educational survey. Access to the pre-educational survey and post-educational survey closed after December 31, 2020. However, access to the educational toolkit website remained opened for providers to access its resources.

Part 2. This phase of the educational intervention was from February 1, 2021 to February 8, 2021 and consisted of the completion of the follow-up toolkit survey which was sent directly to providers' email who participated in Part 1. Access to the follow-up toolkit survey closed after February 8, 2021. However, access to the educational toolkit website remained opened for providers to access its resources.

Descriptive statistics were utilized to describe the data outcomes from the survey responses. This includes the minimum, maximum, median, mean, standard deviation, and the number and percentage of providers responses.

Ethical Considerations & Protection of Human Subjects

The UMASS IRB approval was obtained prior to initiating this DNP Project and it was determined that this DNP project did not meet the requirement for Human Subjects Research and thus IRB approval was waived. Informed consent was provided to the participants via the educational toolkit website which included the purpose of the project, risks and benefits, estimated time to complete the project, and project data that would be shared. See Appendix F for the Online DNP Capstone Consent Form.

It was made clear that participants could discontinue and withdrawal from the project without any consequences at any time during the project. Participants were advised to complete the consent form prior to completing any of the other components of the project. There were no identified risks or harm from participation in this project.

Confidentiality was maintained by de-identifying participant's names, gender, email addresses, and location of practice. The personal information that was shared in project data included participants' medical profession (i.e. M.D.), specialty (i.e. Primary care), and survey responses. Project data and participant information was stored on a password-protected computer that was only accessible to the DNP student.

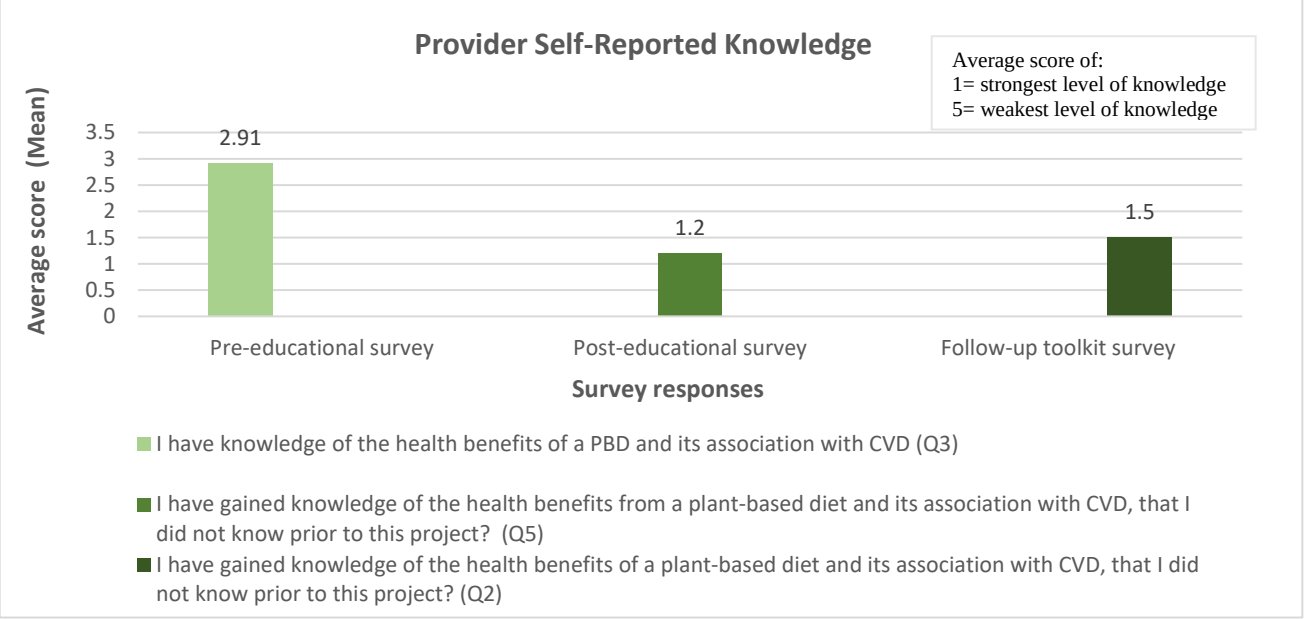
Results

This project was solely web-based due to Covid restrictions, with details emailed to twenty providers, out of which a total of eleven agreed to participate via the consent form in Part One. Eleven providers participated in the pre-educational survey which included two physicians, six nurse practitioners, one physician assistant, and two registered nurses, with specialties, in primary care, internal medicine, cardiology, critical care, neurology, and mental health.

However, only ten of the original eleven providers participated in the post-educational survey and follow-up toolkit survey despite several email follow-ups. The completed pre-educational survey, post-educational survey, and follow-up toolkit survey with providers' responses and basic statistics can be found in Appendix G. Responses reported as average scores are presented below in Figures A, B, C, D, and Table A. Figure A represents provider self-reported knowledge of a PBD and CVD.

Figure A:

Provider Self-Reported Knowledge of a Plant-Based Diet and its association with Cardiovascular Disease



Note: Figure A shows the average score of providers' responses from questions on the pre-educational (Q3), post-educational (Q5), and follow-up toolkit (Q2) surveys related to their self-knowledge of a plant-based diet (PBD) and cardiovascular disease (CVD). Values range from 1-5, with a score of 1 associated with the strongest level of knowledge and 5 associated with the weakest level of knowledge.

The average scores of providers' responses on survey questions related to provider self-reported and concept-based knowledge were assessed to determine if there were changes in

provider knowledge before (pre) and after (post) the educational intervention. Figure A represents the average score of providers' responses from questions on the pre-educational, post-educational, and follow-up toolkit surveys that were related to their self-knowledge of a PBD and its association with CVD.

The results show an average score of 2.91 on the pre-educational survey question 3 (Q3), 1.20 on the post-educational survey Q5, and 1.50 on the follow-up toolkit survey Q2 that were associated with providers' self-reported knowledge of PBD and its association with CVD. These results suggest that there was an increase in provider self-reported knowledge after the educational intervention as represented by the average score of 2.91 on the pre-educational survey which improved to 1.20 on the post educational survey, which equates to a 34% improvement on average test score from pre- to post- survey.

These results suggest that after viewing the educational toolkit's PowerPoint presentation and resources, providers felt that they had gained more knowledge of the health benefits of a PBD and its association with CVD.

There was a slight decrease in self-reported knowledge from 1.20 on the post-educational survey to 1.50 on the follow-up toolkit survey. These results may indicate that after at least a month from the educational intervention, provider's self-reported knowledge may have decreased, which could be due to provider's lack of use of the toolkit resources. However, when compared to the pre-educational survey score (2.91), there remains an increase in provider self-reported knowledge at least a month after the intervention (1.50).

Table A presents the questions on the pre-educational and post- educational survey that are related to knowledge of a PBD and CVD, and the providers' responses as average scores on those questions, as well as the difference between the pre- and post-average scores.

Table A:

Provider Concept-Based Knowledge of Plant-Based Diet and Cardiovascular Disease

Question	Average pre-test (pre-survey)	Average post-test (post-survey)	Difference between pre- and post-
Pre-Q4, Post-Q5: A PBD can prevent or reduce the risk of developing CVD?	1.55	1.00	0.55
Pre-Q6, Post-Q3: Higher intakes of plant proteins can decrease an individual's risk for developing CVD?	2.00	1.00	1.00
Pre-Q7, Post-Q1: You can attain the recommended daily intake of essential nutrients on a plant-based diet (i.e. protein, amino acids, omega-3 fatty acids, b12, calcium)?	2.27	1.10	1.17
Pre-Q8, Post-Q2: Certain plant foods (such as white breads, coconut oil, or fruit juices) can increase an individual's risk for developing CVD?	1.91	1.30	0.61
Total Average:	**2.13**	**1.12**	**1.01**

Note: Table A shows the average score of providers' responses on questions from the pre-educational and post-educational surveys that are related to concept-based knowledge of a PBD and CVD. The average scores' value ranges from 1-5, with a score of 1 associated with the strongest level of knowledge and 5 associated with the weakest level of knowledge. The difference between scores represented by a larger numerical value from 0 are associated with a greater change in knowledge from pre- to post- intervention (i.e. 1.17)

The results from Table A show that on each individual question from the pre-survey compared to the post-survey average scores, there was an increase in provider concept-based knowledge, represented by average post-test values change associated closer to a score of 1. The

question that had the greatest difference between pre-survey and post-survey score, with a value of 1.17, was Pre-Q7 and Post-Q: “You can attain the recommended daily intake of essential nutrients on a plant-based diet (i.e. protein, amino acids, omega-3, fatty acids, b12, calcium?)”.

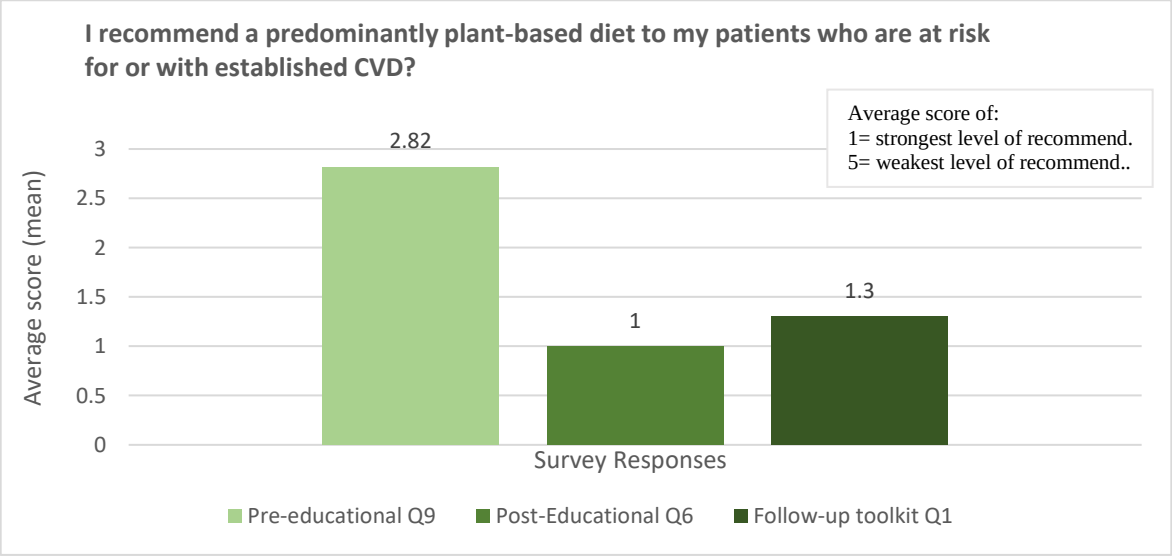
The total average difference between scores shows a 20% improvement in provider concept-based knowledge from pre-test to post-test scores.

Overall, there was an increase in provider self-reported and concept-based knowledge from before (pre- survey) to after (post- survey) the educational intervention by 34% and 20%, respectively, which suggests that the educational toolkit was successful in increasing provider knowledge of a PBD and its association with CVD.

The assessment of provider implementation of PBD education, and of the toolkit resources into their practice was achieved by analysis of data related to specific questions across all three surveys. Figure B represents providers who recommend a PBD to patients.

Figure B:

Provider Recommendation of Plant-Based Diet to Patients



Note: This figure shows the average score of providers’ responses from questions on the pre-educational (Q9), post-educational(Q6), and follow-up toolkit (Q1) surveys that were related to recommendation of a PBD to their patients who are at risk for or have established CVD. Values

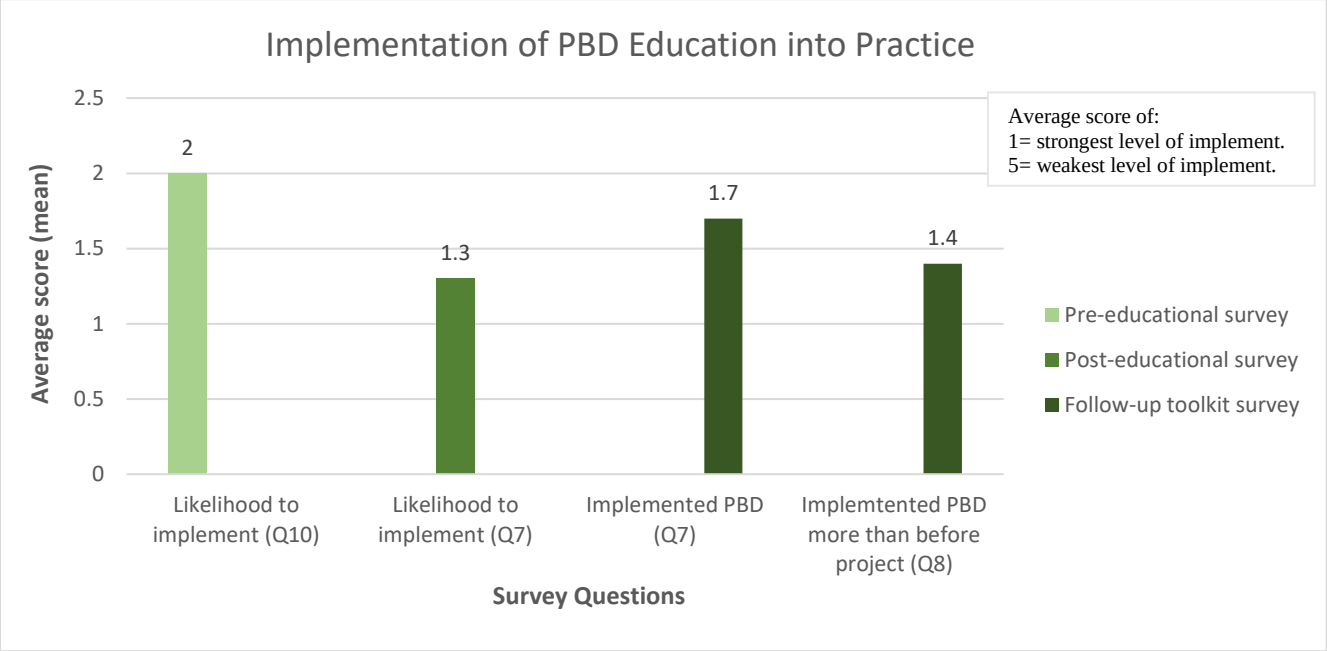
range from 1-5, with a score of 1 associated with the strongest level of recommendation and 5 associated with the weakest level of recommendation.

Results from Figure B show an average score of 2.82 on the pre-educational survey Q9, score of 1.00 on the post-educational survey Q6, and score of 1.30 on the follow-up toolkit survey Q1. These results show that there was an overall increase in provider likelihood to recommended and recommendation of a predominately PBD to their patients after participating in the educational intervention. This suggests that the educational toolkit was successful in providing information and resources that may have led to an increase provider recommendation of a PBD to their patients who are at risk for or with established CVD.

Figure C represents provider implementation of PBD education into their practice.

Figure C

Provider Implementation of Plant-Based Diet Education into Practice



Note: Figure C shows the average scores of providers' responses from questions on the pre-educational (Q10), post-educational(Q7), and follow-up toolkit (Q7, Q8) surveys that are related to implementation of PBD education into their practice. Values range from 1-5, with a score of 1

associated with the strongest level of likelihood to implement or implementation, and a score of 5 associated with the weakest level of likelihood to implement or implementation.

Pre-educational survey Q10 and post-educational survey Q7 assessed for provider likelihood to implement PBD education into their practice represented by average scores of 2.00 and 1.30, respectively. These results suggest that following the educational intervention there was an increase in provider likelihood to implement PBD education into their practice.

The follow-up toolkit survey Q7 assessed for provider implementation of PBD education into their practice represented by an average score of 1.70 and Q8 assessed for implementation of PBD education more now than they did prior to participating in this project represented by an average score of 1.40. These results show a favor closer to 1 which is associated with a strong level of implementation.

Table B represents provider implementation of PBD education into their practice utilizing the same survey questions as seen above in Figure C, but in a different format to show the number of providers on the responses.

Table B:

Provider Implementation of Plant-Based Diet Education into Practice

Survey Question:	Strongly Agree/ Always Responses (# of participants):	Agree/ Usually Responses (# of participants):	Neither Agree Nor Disagree/ Sometimes Responses (# of participants):
Pre- (Q10): I would consider implementing PBD education into my practice?	3	5	3
Post- (Q7): I would consider implementing a PBD education/ nutrition program into my practice?	7	3	
Follow-up (Q7): I have implemented PBD education into my practice?	4	5	1
Follow-up (Q8): I include PBD education into my practice more than I did prior to participating in this project?	6	4	

Note: Table B shows the number of providers' responses on questions from the pre-educational survey (pre-Q10), post-educational survey (post-Q7), and follow up toolkit survey (follow up Q7 and Q8) related to implementation of PBD education into their practice. Answer choices to the questions that providers selected included: Strongly Agree, Agree, Neither Agree Nor Disagree; Always, Usually, or Sometimes.

Looking at the number of providers' responses on the pre-educational survey Q10 (pre-Q10) before the educational intervention, three providers 'strongly agreed' they would consider implementing PBD education into practice, five providers 'agreed', and three providers 'neither agreed nor disagreed'.

The same question that was asked on pre-Q10 “I would consider implementing a PBD education into my practice?” was asked on the post-educational survey Q7 (post-Q7) after the educational intervention, in which seven providers ‘strongly agreed’ and three providers ‘agreed’, showing a greater number of providers changed their responses to ‘strongly agreed’. Thus, based on the change in number of providers’ responses favoring implementation after the educational intervention, suggests an association that the education intervention was successful in increasing provider likelihood to implement PBD education into their practice.

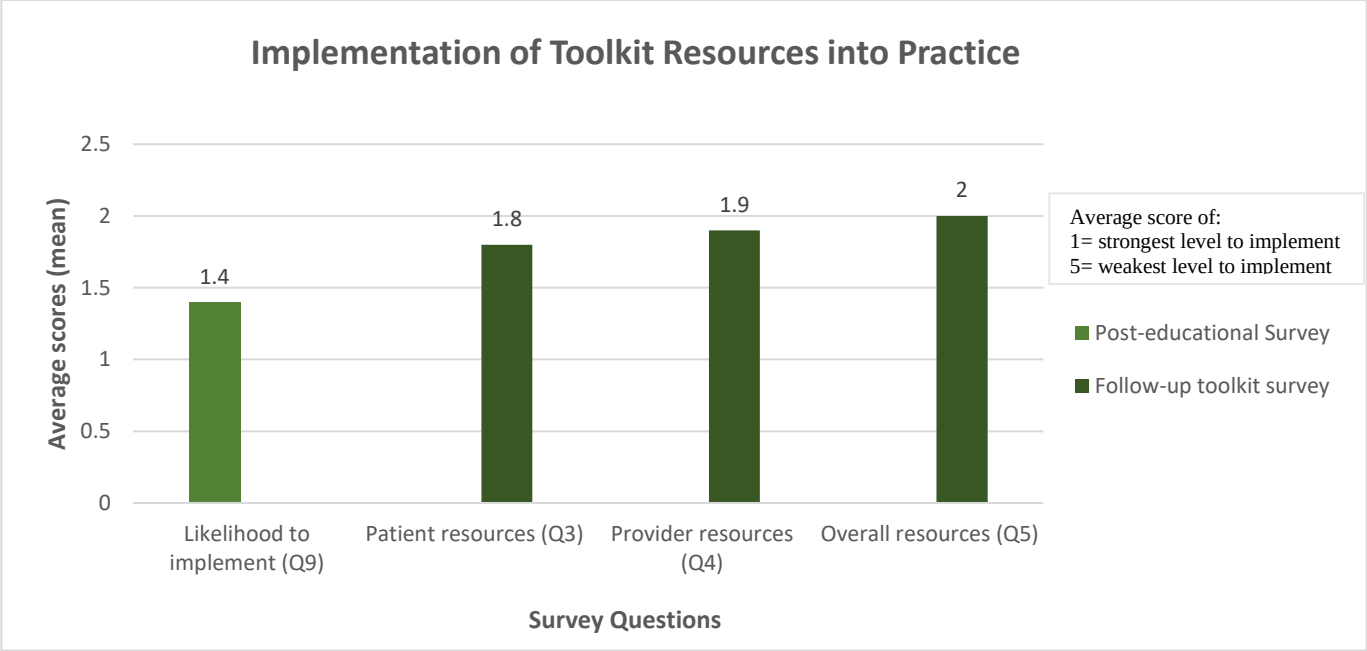
On the follow-up toolkit survey Q7, four providers reported they ‘always’ implement PBD education, five providers reported ‘usually’, and one provider reported ‘sometimes’. These results show that nine of the ten providers, or 90%, at least usually implement PBD education into their practice.

Follow up toolkit survey Q8 assessed if providers implemented PBD education more now than they did prior to participating in the project, of which six providers reported they ‘strongly agreed’ and four providers reported ‘agreed’. These results show that all of the providers at least agreed that they implemented PBD education more now than they did prior to participating in the project. Overall, these results may suggest that the educational toolkit was useful to providers in implementing PBD education into their practice.

The following Figure D represents provider implementation of the toolkit resources into their practice.

Figure D:

Provider Implementation of Toolkit Resources into Practice



Note: Figure D shows the average scores of providers' responses from questions on the post-educational (Q9) and follow-up toolkit (Q3, Q4, Q5) surveys that are related to implementation of the toolkit resources into their practice. Values range from 1-5, with a score of 1 associated with the strongest level to implement and 5 associated with the weakest level to implement.

The results from Figure D show an average score of providers' responses on questions related to implementation of toolkit resources. Post-educational survey Q9 was related to likelihood of providers to implement the patient and provider resources into their practice, represented by average score of 1.40. The follow-up toolkit survey Q3 was related to actual use of the patient resources with a mean score of 1.80; Q4 was related to actual use of the provider resources with a score of 1.90; Q5 was related to overall use of the toolkit resources with a score of 2.00.

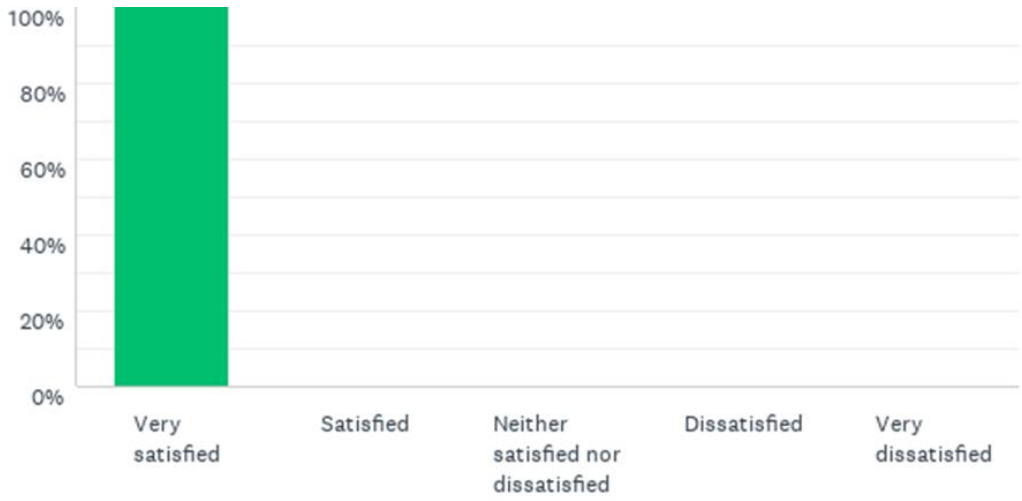
Providers' responses on the post-educational survey Q9 were the closest score to 1, favoring a strong likelihood to implement toolkit resources. This may suggest that after the educational intervention, the majority of providers felt strongly to implement the resources into their practice.

Comparing likelihood to implement to actual implementation of resources, based on the average scores, there was a stronger favor of likelihood to implement than actual implementation of resources as seen by slight decline from 1.4 to 1.8, 1.9, and 2. There was a slight favor in utilization of patient resources (1.80) than provider resources (1.90). However, the average scores that represent actual implementation of patient, provider, and overall resources are at a value of 2 or less, which still favors a strong association to implement on the scale of 1-5.

The assessment of provider satisfaction with the educational toolkit. Questions eight and ten (Q8, Q10) on the post-educational survey related to provider satisfaction.

Figure E:

Post Survey Q10: Overall, how satisfied are you with the web-based educational toolkit (i.e. lecture, resources, ease of use)?



Note: Figure E represents provider satisfaction with the educational toolkit. One hundred percent (100%), or 10/10, of the providers responded with 'Very satisfied'.

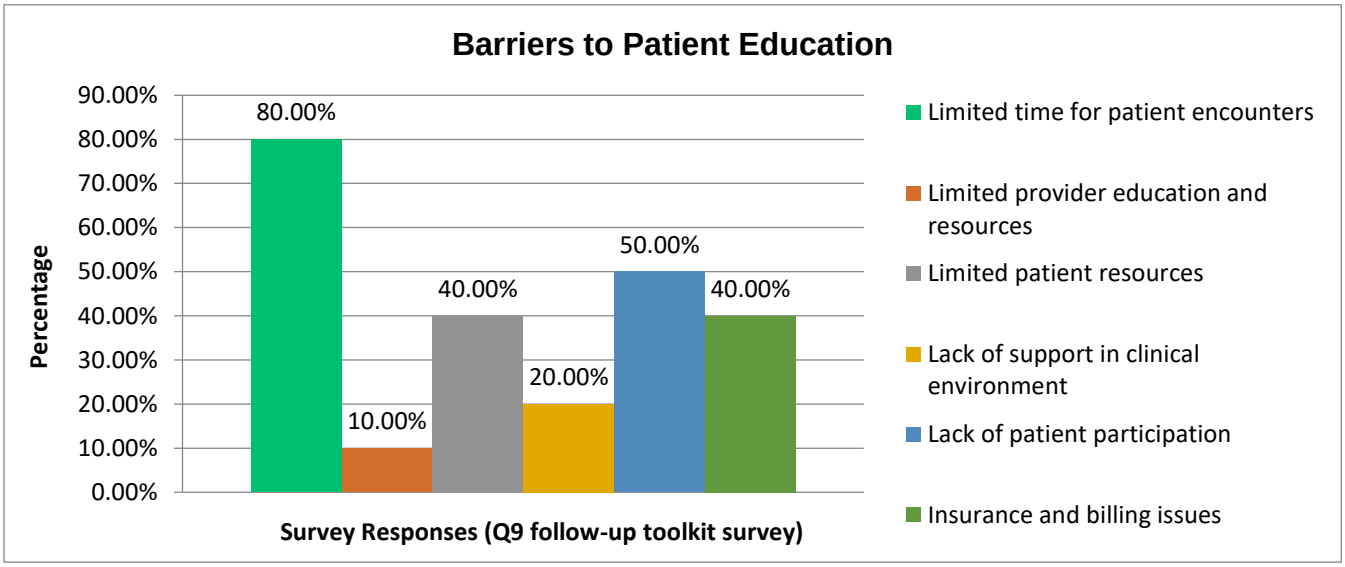
Question eight assessed if the information in the PowerPoint presentation was valuable for their practice, in which 70% or 7/10 providers 'strongly agreed', and 30% or 3/10 providers

'agreed'. Overall, all of the providers responded that it was valuable for their practice. Visual representation of this data can be found in Appendix G: Post-Educational Survey: Responses Q8. Question 10 (Q10) assessed for provider overall satisfaction with the toolkit, including PowerPoint presentation, resources, ease of use of a web-based toolkit. Figure E shows that 10/10 providers, or 100%, were 'very satisfied' represented by an average score of 1.00, which is associated with strongest level of satisfaction.

The assessment of barriers that may interfere with patient education on primary prevention of CVD, including nutrition, is represented by Figure F.

Figure F

Barriers to Patient Education on Primary Prevention of Cardiovascular Disease



Note: Figure F shows providers' responses as percentages from follow-up toolkit (Q9) survey that is related to barriers that they may experience in their practice to providing patient education on the primary prevention of cardiovascular disease, including nutrition.

Results from Figure F show providers' responses as percentages on Q9 from the follow-up toolkit survey, which assessed for barriers that the providers may experience to providing patient education on the primary prevention of cardiovascular disease, including nutrition. The

barrier that was the most selected was ‘limited time for patient encounters’, of which eighty percent (80%) of providers responded that this was a barrier that they experience in their practice. This may suggest that this is a common barrier experienced in healthcare and should be further investigated to determine what can be improved to allow for more time to provide patient education during patient encounters. Furthermore, the other barriers are significant and should also be further investigated to improve patient care.

Discussion

The educational toolkit appeared to be successful in increasing provider self-reported and concept-based knowledge, recommendation of PBD to patients, implementation of PBD education and toolkit resources into their practice. Furthermore, all ten providers at least agreed that they implemented PBD education more now than they did prior to participating in the project and were very satisfied with the overall toolkit presentation. These results suggest that the web-based educational toolkit was successful in providing useful evidence-based knowledge and resources to providers on a PBD and CVD prevention.

Provider responses seemed to favor likelihood to implement toolkit resources into practice when compared to actual implementation of resources into practice. However, there was still a strong association with actual implementation of resources, particularly the patient resources.

There were minimal decreases in provider self-reported knowledge, recommendation of PBD to patients, and implementation of toolkit resources at least a month after providers had participated in the educational intervention, which may suggest that they were not utilizing the toolkit as frequently.

There were a variety of barriers that providers reported they experience in their practice setting, with the most common barrier being lack of time for patient encounters. All of these barriers may interfere with providing adequate patient education and suggest further investigation for improvements in patient care to lessen these barriers.

Pender's Health Promotion Model was selected to guide this project's intervention. The major strength of this model is the focus on health promotion and disease prevention, with education and interventions primarily implemented by nurses (Gonzalo, 2019; Nursing Theory, 2016). This associated with the objectives of this DNP project with the intervention, an educational toolkit, being provided by this DNP student. The educational toolkit served as a tool for health promotion through education on a lifestyle modification, such as a PBD, to prevent and reduce risk factors for cardiovascular disease. By educating providers on a PBD and CVD prevention, it may lead to improvements in patient education and partnerships, and patient self-care behaviors, self-efficacy, and health outcomes (AHA, 2017c; Kris-Etherton et al., 2014; Paterick, et al., 2017).

Facilitators for this project included providers who had an interest in gaining knowledge of a PBD and cardiovascular disease prevention and how it can benefit their patients, and who desired to participate in the project. A major barrier faced was obtaining provider participation in the project and maintaining it throughout project completion. The project was emailed to twenty providers, of which eleven participated in the pre-educational survey, and ten participated in the post-educational and follow-up surveys. Several reminder emails were sent throughout the intervention phase to the providers who agreed to participate via the consent form. This barrier may have been due to provider lack of time or interest to participate.

Conclusion

Cardiovascular disease is a global and nation-wide health problem affecting millions of people and is a major economic burden. CVD is largely preventable through early education and implementation of healthy lifestyle behaviors that prevent or reduce modifiable CVD risk factors. Precisely, the diet we consume has a significant impact on the prevention or progression of CVD and several of its risk factors. Current research and guidelines support a PBD for the prevention, reduction, or management of CVD risk factors. Findings within this literature also show a positive and sustained impact on patient's dietary adherence with implementation of PBD education into practice. However, there is a lack of knowledge amongst providers regarding a PBD and its positive association with cardiovascular health and disease prevention, as well as a lack of patient education regarding this lifestyle modification.

The findings from this project suggest that a web-based educational toolkit with evidence-based resources may be a useful approach for providing education and resources to healthcare providers on a plant-based diet and cardiovascular disease prevention. Furthermore, it can allow for easy-access and gives providers helpful resources not only for themselves, but also for their patients, which may lead to improved patient care and health outcomes.

A future consideration may include expanding access to the educational toolkit and its resources to the public. This may lead to an increase in the general public's awareness of plant-based nutrition and cardiovascular disease prevention, as well as provide the public with free and accessible resources that they may not receive in a healthcare setting. Furthermore, this web-based approach to providing easy-accessible and evidence-based education and resources may be useful to healthcare providers and patients for a variety of healthcare needs beyond this project's objectives.

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Appendix A

Table 1:

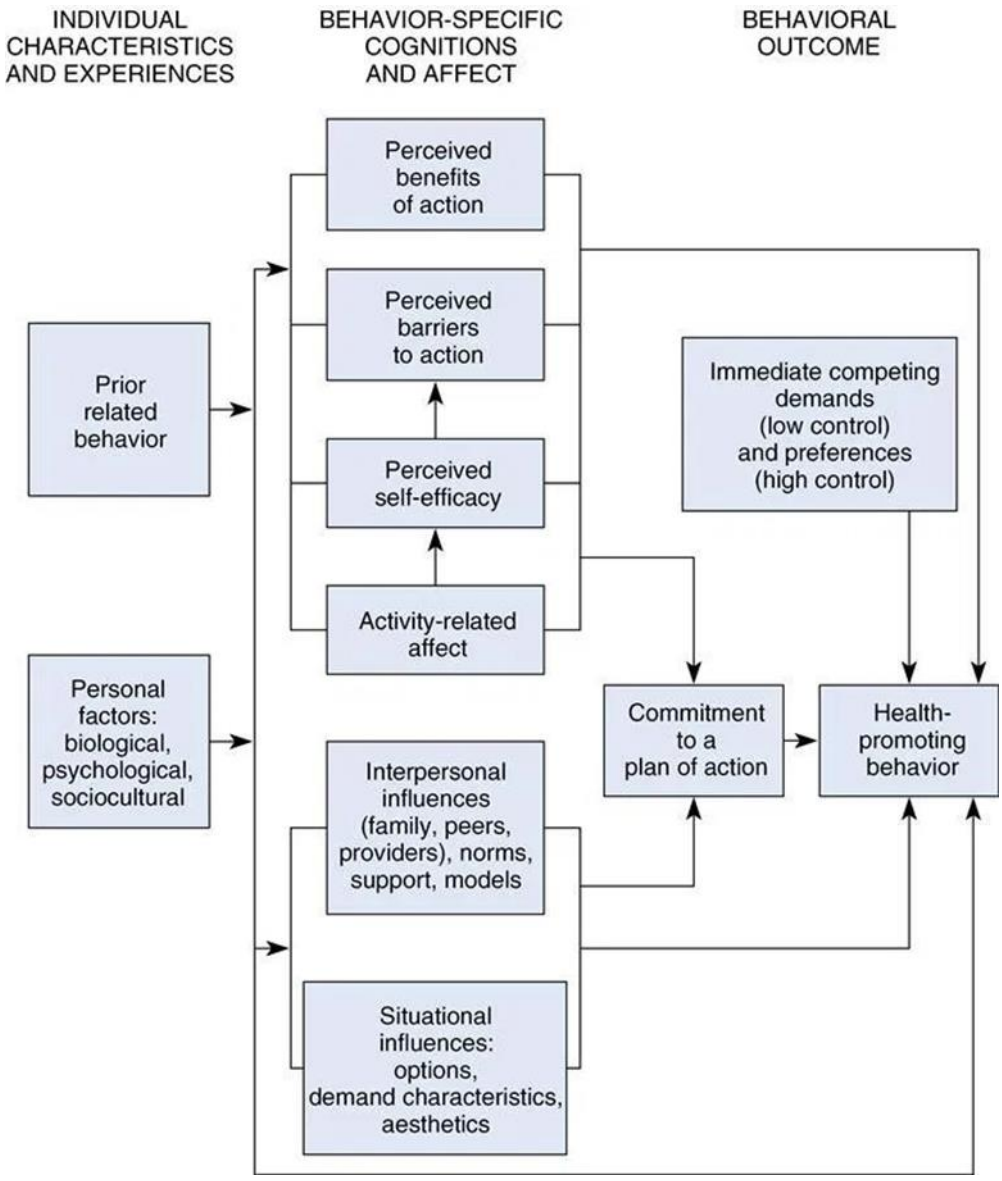
Evidence Level & Quality of Research

EVIDENCE TYPE	JHNEPB EVIDENCE LEVEL AND QUALITY	LITERATURE
RANDOMIZED CONTROL TRIALS (RCT)	Level I Quality A	Barnard et al., 2006; Koeth et al., 2018; Wright et al., 2017
NON-RCT EXPERIMENTAL STUDIES	Level I Quality A	Chan et al., 2016; Elliot et al., 2006; Esselstyn, et al., 2014; Fratteroli et al., 2008; Stamler et al., 2013
NON-RCT EXPERIMENTAL LONGITUDINAL COHORT STUDIES	Level I Quality A	Kim et al., 2019; Satija et al., 2017; Song et al., 2016; Tharrey et al., 2018
MIXED METHODS STUDY	Level II Quality A	Morin et al., 2019
CLINICAL PRACTICE GUIDELINES	Level IV Quality A	Arnett et al., 2017; Casey Jr. et al., 2019
SYSTEMATIC REVIEW	Level IV Quality A	Zhu et al., 2016
EXPERT OPINION	Level IV Quality A	AHA, n.d.; AHA, 2017b; AHA, 2017c; AHA 2017d; Belardo & Klatt, 2020; Esselstyn, 2001; Pallazola et al., 2019; Satija et al., 2018; Tuso et al., 2015; Willet & Ludwig, 2020
QUALITY IMPROVEMENT	Level V Quality B	Rahman, 2019

Appendix B

Figure 1:

Pender's Health Promotion Model



Appendix C

Outline of Toolkit

The link to the website is: https://pbdtoolkitdnp.org/

- Informed Consent
- Surveys:
    - Pre-educational
    - Post-educational
- Power Point Lecture
    - Objectives
    - Cardiovascular disease (CVD) burden:
        - Mortality
        - Health
        - Economic
    - Gaps in healthcare:
        - Issues
        - Needs
    - Plant-based diet (PBD):
        - What is it?
        - Benefits
        - Essential nutrients
    - Nutrient risk factors for CVD
    - Review of literature & research studies:
        - Clinical practice guidelines
            - AHA/ACC 2019 Primary Prevention of CVD
        - Hypertension
            - Elliot, et al., 2006
        - Diabetes, Hyperlipidemia, Body weight
            - Barnard et al., 2006; Morin et al., 2019 Wright et al., 2017
        - CV incidence & mortality
            - Kim et al., 2019; Satija et al., 2017; Song et al., 2016; Tharrey et al., 2018
        - Secondary Outcomes
    - Contact information
    - References
- Patient and provider resources

Appendix D

Online Surveys (pre-educational, post-educational, follow-up toolkit)

Pre-educational survey

1. What is your profession?
- Physician (MD or DO)
- Nurse Practitioner
- Physician Assistant
- Registered Nurse
- Other

2. What is your specialty? (i.e. Primary Care, Cardiology)

3. I have knowledge of the health benefits from a plant-based diet and its association with cardiovascular disease (CVD)?
- A great deal
- A lot
- A moderate amount
- A little
- None at all

4. A plant-based diet can prevent or reduce the risk of developing CVD?
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

5. A plant-based diet is a guideline-recommended diet for the prevention of CVD?
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

6. Higher intakes of plant proteins can decrease an individual's risk for developing CVD?
- Strongly agree

- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

7. You can attain the recommended daily intake of essential nutrients on a plant-based diet (i.e. protein, amino acids, omega-3 fatty acids, b12, calcium)?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

8. Certain plant foods (such as white breads, coconut oil, or fruit juices) can increase an individual's risk for developing CVD?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

9. I recommend a predominantly plant-based diet to my patients who are at risk for or with established CVD?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

10. I would consider implementing plant-based diet education into my practice?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

Post-Educational Survey

1. You can attain the recommended daily intake of essential nutrients on a plant-based diet (i.e. protein, amino acids, omega-3 fatty acids, b12, calcium, iron)?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

2. Certain plant-based foods (such as white breads, coconut oil, or fruit juices) can increase an individual's risk for developing cardiovascular disease (CVD)?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

3. Higher intakes of plant proteins can decrease an individual's risk for developing CVD?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

4. A plant-based diet can prevent or reduce the risk for developing CVD?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

5. I have gained knowledge of the health benefits from a plant-based diet and its association with CVD, that I did not know prior to this project?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

6. How likely are you to recommend a plant-based diet to your patients who are at risk for or with established CVD?

- Very likely
- Likely
- Neither likely nor unlikely
- Unlikely
- Very unlikely

If not, in a few brief words, why?

7. I would consider implementing a plant-based diet education/ nutrition program into my practice?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

If not, in a few brief words, why?

8. The information provided in the PowerPoint lecture is valuable for my practice?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

9. How likely will you use the included patient and provider resources in your practice?

- Very likely
- Likely
- Neither likely nor unlikely
- Unlikely
- Very unlikely

10. Overall, how satisfied are you with the web-based educational toolkit (i.e. lecture, resources, ease of use)

- Very satisfied
- Satisfied
- Neither satisfied nor dissatisfied
- Dissatisfied
- Very dissatisfied

Optional: Do you have any recommendations?

Follow-up toolkit survey

1. I recommend a predominantly plant-based diet to my patients at risk for or with established cardiovascular disease (CVD)?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

2. I have gained knowledge of the health benefits of a plant-based diet and its association with CVD, that I did not know prior to this project?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

3. I provide my patients with the patient resources from the project toolkit who are interested in a plant-based diet or who are at risk for cardiovascular disease?

- Always
- Usually
- Sometimes
- Rarely
- Never

4. I utilize the provider resources (at least one) included in the project toolkit?

- Always
- Usually
- Sometimes
- Rarely
- Never

5. I have been utilizing the resources from the project toolkit since participating in this project?

- Always
- Usually
- Sometimes
- Rarely
- Never

6. I find the project resources useful in implementing plant-based diet education into my practice?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

7. I have implemented plant-based diet education into my practice?

- Always
- Usually
- Sometimes
- Rarely
- Never

8. I include plant-based diet education into my practice more than I did prior to participating in this project?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

9. Do you encounter any barriers that may interfere with patient education on primary prevention of CVD, including nutrition? (Select all that apply).

- [ ] Limited time for patient encounters
- [ ] Limited provider education and resources
- [ ] Limited patient resources
- [ ] Lack of support in clinical environment
- [ ] Lack of patient participation
- [ ] Insurance and billing issues

10. How interested are you in learning more about a plant-based nutrition and how to implement it into your practice?

- Extremely interested
- Very interested
- Somewhat interested
- Not so interested
- Not at all interested

Appendix E

Email to participants

Greetings!

You are being invited to participate in an educational improvement project titled 'An Educational Toolkit for Providers on a Plant-Based Diet for Cardiovascular Disease Prevention'. This educational project is being conducted by Alexandra Collette from the University of Massachusetts Amherst College of Nursing, Doctor of Nursing Practice program. You were selected to participate in this project because you are a healthcare provider (physician, nurse practitioner, physician assistant, registered nurse) that may encounter patients who are risk for cardiovascular disease.

The educational toolkit is all online/web-based and includes all the project components listed below in Part 1. Furthermore, the website contains resources for providers and patients. If you participate in Part 1., then you will receive Part 2. via your email.

The link to the website is: https://pbdtoolkitdnp.org/

The totality of this project includes:
Part 1. To be completed by no later than **December 31, 2020**:

- Consent form
- Pre-educational survey (1 min)
- Evidence-based lecture on cardiovascular disease prevention and plant-based nutrition (60 min)
- Post-educational survey (1 min)

Part 2. To be completed by no later than **February 8, 2021**

- Follow-up toolkit survey (1 min)

Please note, your personal information (i.e. name, email) will be confidential and not be shared in project data. Your responses on the surveys will be anonymous.
Any questions or concerns please do not hesitate to reach me at alcollette@umass.edu

Thank you for your consideration and participation!

Alexandra Collette
BSN, RN
DNP, FNP student

Appendix F

Online DNP Consent Form for Participants

Online DNP Project Consent Form

You are being invited to participate in an educational improvement project titled 'An Educational Toolkit for Providers on a Plant-Based Diet for Cardiovascular Disease Prevention'. This educational project is being conducted by Alexandra Collette from the University of Massachusetts Amherst College of Nursing, Doctor of Nursing Practice program. You were selected to participate in this study because you are a healthcare provider (physician, nurse practitioner, physician assistant, registered nurse) that may encounter patients who are risk for cardiovascular disease (CVD).

Why is this project being conducted?
The purpose of this educational toolkit is aid healthcare providers (physicians, nurse practitioners, physician assistants, and registered nurses) with evidence-based knowledge and resources on a healthy plant-based diet and its benefits on preventing or reducing CVD risk factors, with the aim of increasing provider knowledge and hopes of improving patient care.

Who can participate in this project?
Physicians, nurse practitioners, physician assistants, and registered nurses, with a medical background in primary care, family medicine, internal medicine, integrative medicine, cardiology, neurology, and endocrinology/diabetes care.

What will I be asked to do and how much time will it take?
The totality of this project includes:

To be completed between October 2020- December 2020 (located on website):

- Consent Form
- Pre-educational survey (1 min)
- PowerPoint lecture on plant-based diets and cardiovascular health (60 mins)
- Post-educational survey (1 min)

To be completed by February 8, 2021 (sent to your email):

- Follow-up toolkit survey (1 min)

Will participating in this project help me in any way?
This project may lead to an increase in provider knowledge of plant-based nutrition and its benefits for cardiovascular health and disease prevention, which may lead to improved patient education and care. Additional benefits that may come as a result of this project may include implementation of a plant-based nutrition education program at clinical sites and improved patient health outcomes through prevention or reduction in CVD risk factors.

What are my risks?
I believe there are no risks or harm associated with participating in this educational intervention. However, a risk of breach of confidentiality always exists and I have taken the steps to minimize this risk as outlined in a section below.

An intended constraint may be the time required to complete the project. However, this project may be completed at your preferred location (i.e. home or office) and can be done at any time of the day that is convenient for you. Furthermore, the project will not be timed and can be paused and resumed to allow for flexibility.

How will my personal information be protected?
Confidentiality will be maintained by de-identifying participant's names, gender, email addresses, location of practice, and any other personal identifiers that will not be included in the information that will be shared.
The personal information that will be shared as data will include participant's medical profession (i.e. M.D., ARNP), and specialty (i.e. Primary care, Cardiology), as well as the responses on the three surveys. Project data and participant information, mentioned above, will be stored on a password protection computer which will be accessible only by the DNP student conducting this project.

Will I be given any money or other compensation for being in this project?
Participants will not receive money or any other form of compensation for this project.

What happens if I say yes, but I change my mind later?
You do not have to participate in this project if you do not want to. If you agree, but later change your mind, you may drop out at any time. There are no penalties or consequences of any kind if you decide that you do not want to participate.

Who can I talk to if I have questions?
If you have questions or concerns about this project, you may contact the DNP student, Alexandra Collette at alcollette@umass.edu. If you need to contact the UMASS faculty sponsor, you may contact Dr. Pamela Aselton at paselton@nursing.umass.edu.

By filling out the form below and clicking "I Agree" you are indicating that you are at least 18 years old, have read this consent form, and agree to participate in this educational improvement project.

Fill out the form first. Then click "Next: Pre- Survey" button to be directly taken to the Pre-Educational Survey.

*Your name and email will not be shared in any project data nor will be used outside of this project. Only the DNP student conducting this project will see this information.

Name:
Email:

I Agree

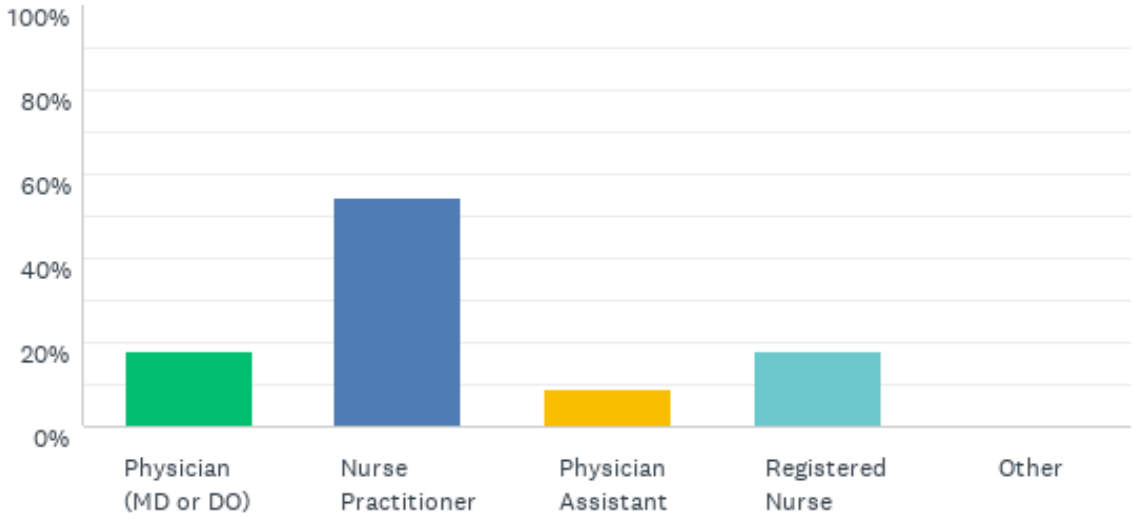
Appendix G

Online Surveys (pre-educational, post-educational, follow-up toolkit):

Provider Responses & Data Analysis

Pre-Education Survey: Responses

Q1: What is your profession?



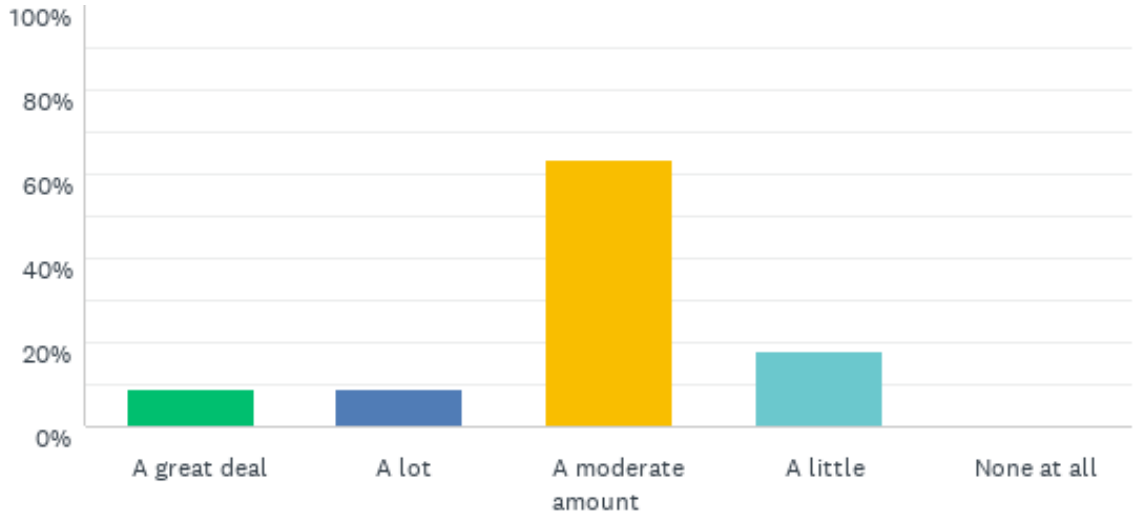
ANSWER CHOICES	RESPONSES	
Physician (MD or DO) (1)	18.18%	2
Nurse Practitioner (2)	54.55%	6
Physician Assistant (3)	9.09%	1
Registered Nurse (4)	18.18%	2
Other (5)	0.00%	0
TOTAL		11

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	4.00	2.00	2.27	0.96

Q2: What is your specialty? (i.e. Primary Care, Cardiology)

#	RESPONSES
1	Primary Care
2	Mental health
3	Cardiology Critical Care
4	Internal Medicine, Critical Care
5	Primary Care
6	Neurology
7	Primary care
8	Cardiology
9	Cardiology
10	Cardiology

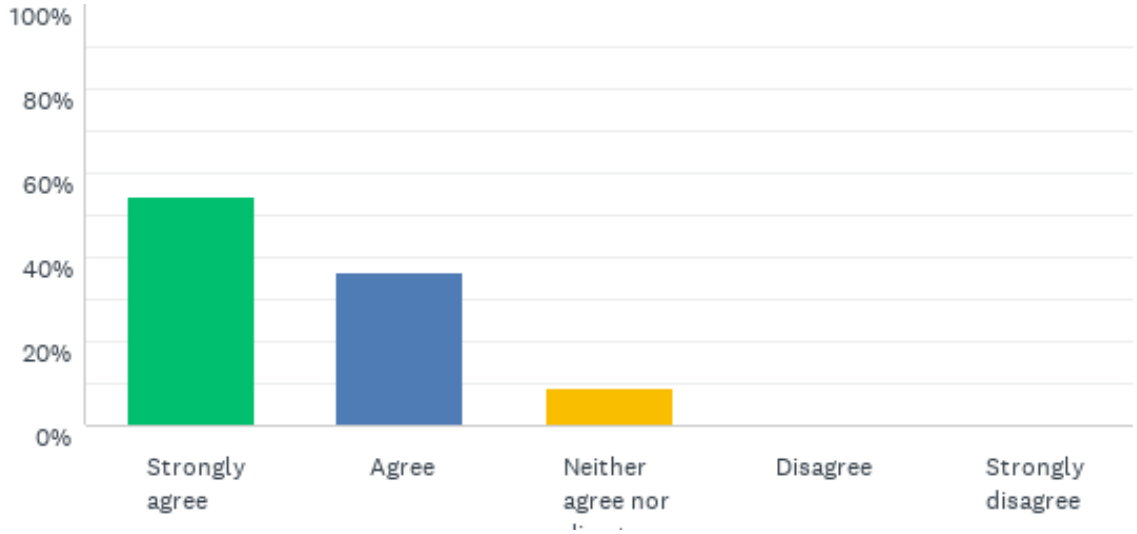
Q3: I have knowledge of the health benefits from a plant-based diet and its association with cardiovascular disease (CVD)?



ANSWER CHOICES	RESPONSES	
A great deal (1)	9.09%	1
A lot (2)	9.09%	1
A moderate amount (3)	63.64%	7
A little (4)	18.18%	2
None at all (5)	0.00%	0
TOTAL		11

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	4.00	3.00	2.91	0.79

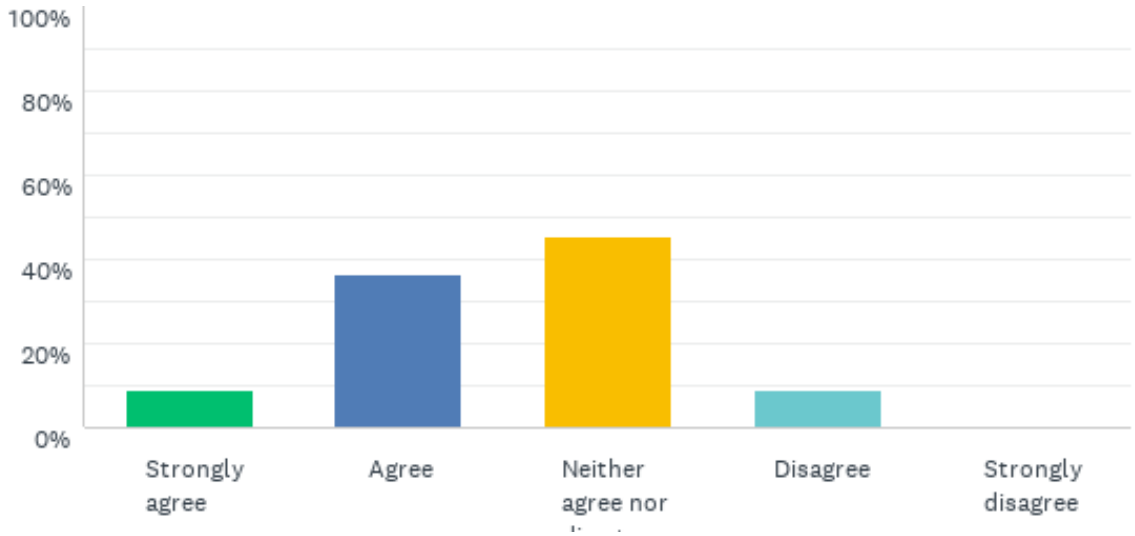
Q4: A plant-based diet can prevent or reduce the risk of developing CVD?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	54.55%	6
Agree (2)	36.36%	4
Neither agree nor disagree (3)	9.09%	1
Disagree (4)	0.00%	0
Strongly disagree (5)	0.00%	0
TOTAL		11

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	3.00	1.00	1.55	0.66

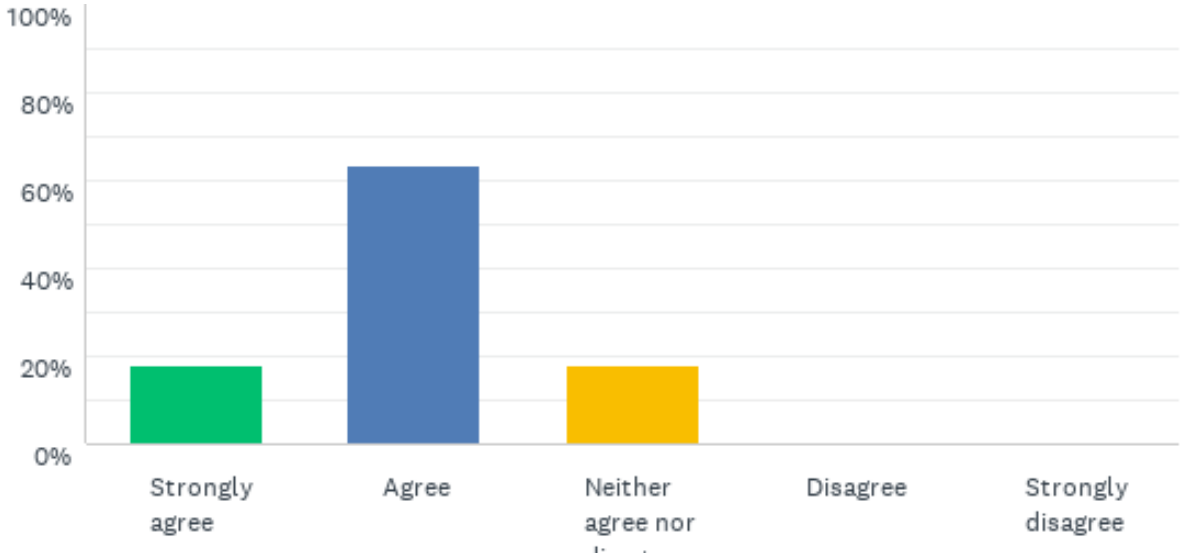
Q5: A plant-based diet is a guideline-recommended diet for the prevention of CVD?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	9.09%	1
Agree (2)	36.36%	4
Neither agree nor disagree (3)	45.45%	5
Disagree (4)	9.09%	1
Strongly disagree (5)	0.00%	0
TOTAL		11

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	4.00	3.00	2.55	0.78

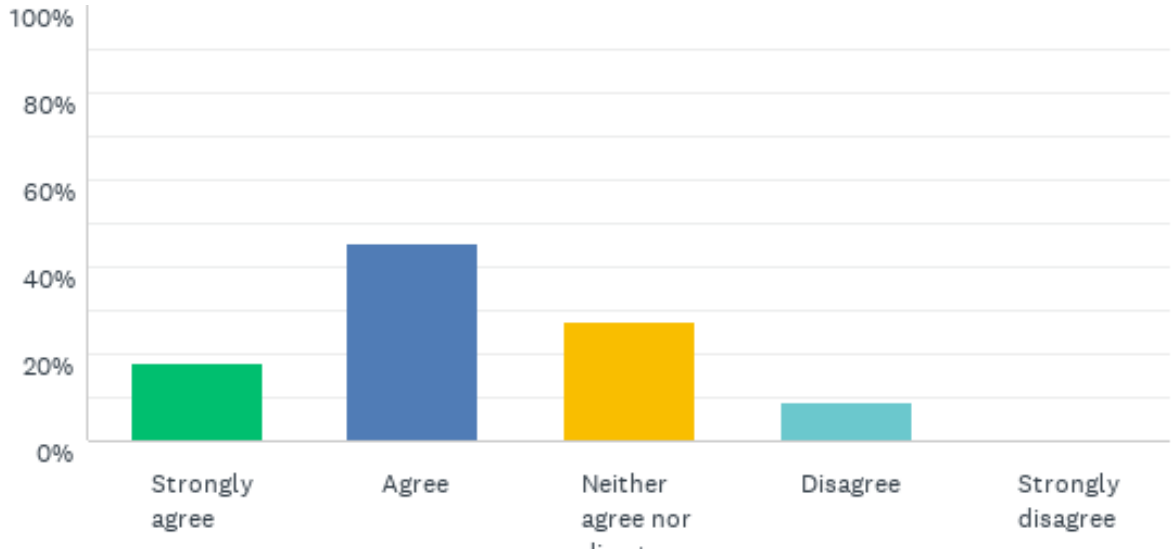
Q6: Higher intakes of plant proteins can decrease an individual's risk for developing CVD?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	18.18%	2
Agree (2)	63.64%	7
Neither agree nor disagree (3)	18.18%	2
Disagree (4)	0.00%	0
Strongly disagree (5)	0.00%	0
TOTAL		11

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	3.00	2.00	2.00	0.60

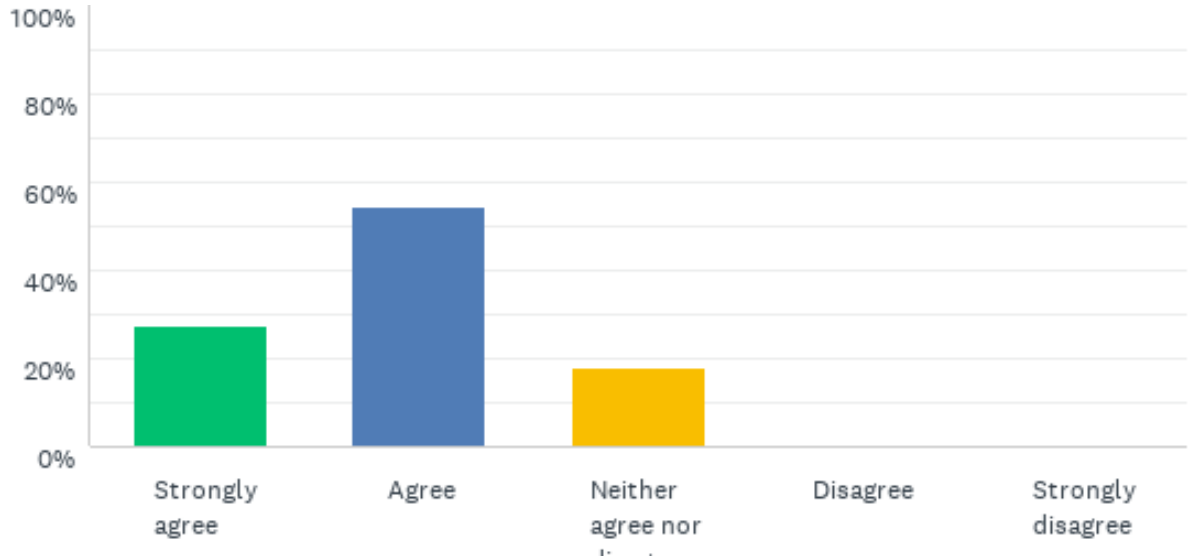
Q7: You can attain the recommended daily intake of essential nutrients on a plant-based diet (i.e. protein, amino acids, omega-3 fatty acids, b12, calcium)?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	18.18%	2
Agree (2)	45.45%	5
Neither agree nor disagree (3)	27.27%	3
Disagree (4)	9.09%	1
Strongly disagree (5)	0.00%	0
TOTAL		11

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	4.00	2.00	2.27	0.86

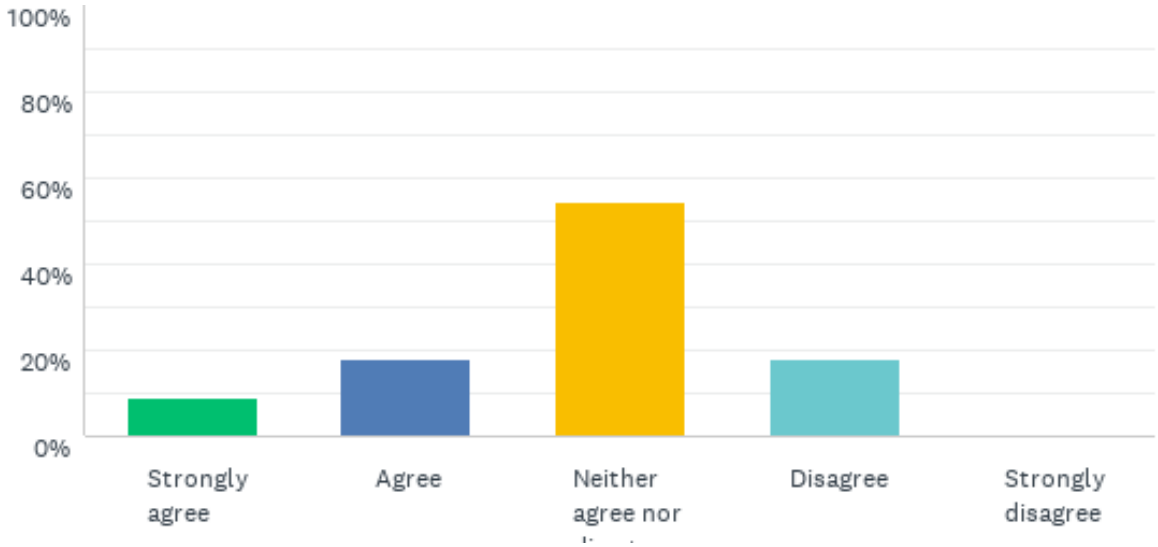
Q8: Certain plant foods (such as white breads, coconut oil, or fruit juices) can increase an individual's risk for developing CVD?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	27.27%	3
Agree (2)	54.55%	6
Neither agree nor disagree (3)	18.18%	2
Disagree (4)	0.00%	0
Strongly disagree (5)	0.00%	0
TOTAL		11

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	3.00	2.00	1.91	0.67

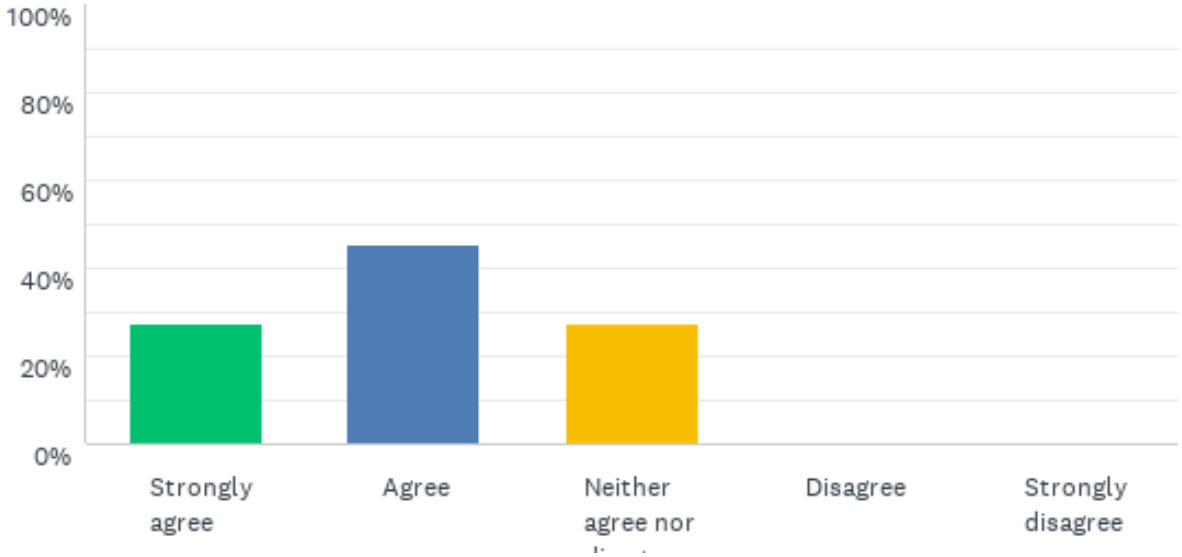
Q9: I recommend a predominantly plant-based diet to my patients who are at risk for or with established CVD?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	9.09%	1
Agree (2)	18.18%	2
Neither agree nor disagree (3)	54.55%	6
Disagree (4)	18.18%	2
Strongly disagree (5)	0.00%	0
TOTAL		11

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	4.00	3.00	2.82	0.83

Q10: I would consider implementing plant-based diet education into my practice?

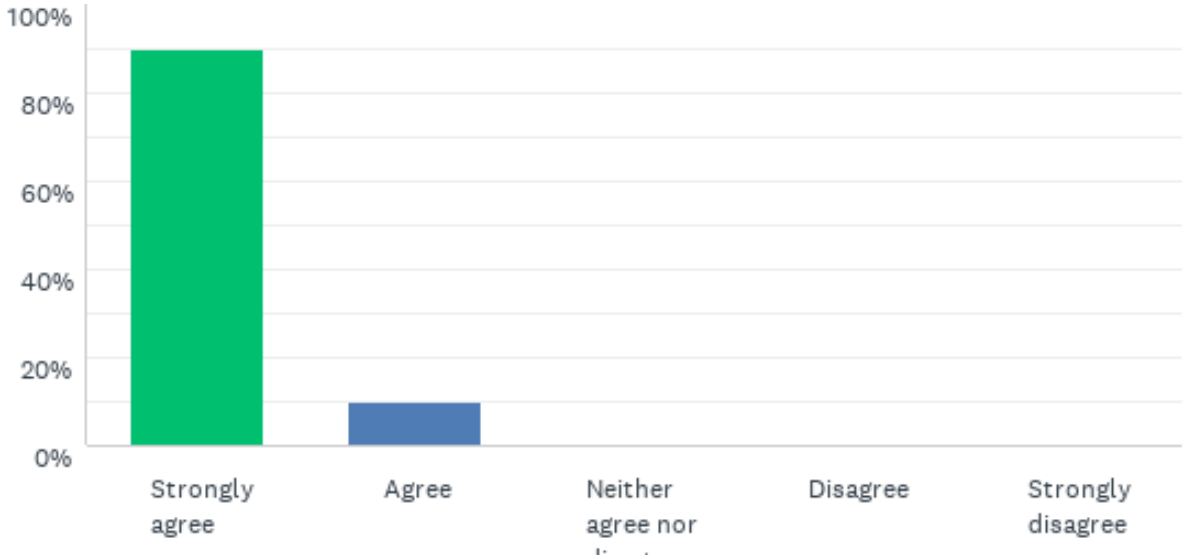


ANSWER CHOICES	RESPONSES	
Strongly agree (1)	27.27%	3
Agree (2)	45.45%	5
Neither agree nor disagree (3)	27.27%	3
Disagree (4)	0.00%	0
Strongly disagree (5)	0.00%	0
TOTAL		11

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	3.00	2.00	2.00	0.74

Post-Educational Survey: Responses

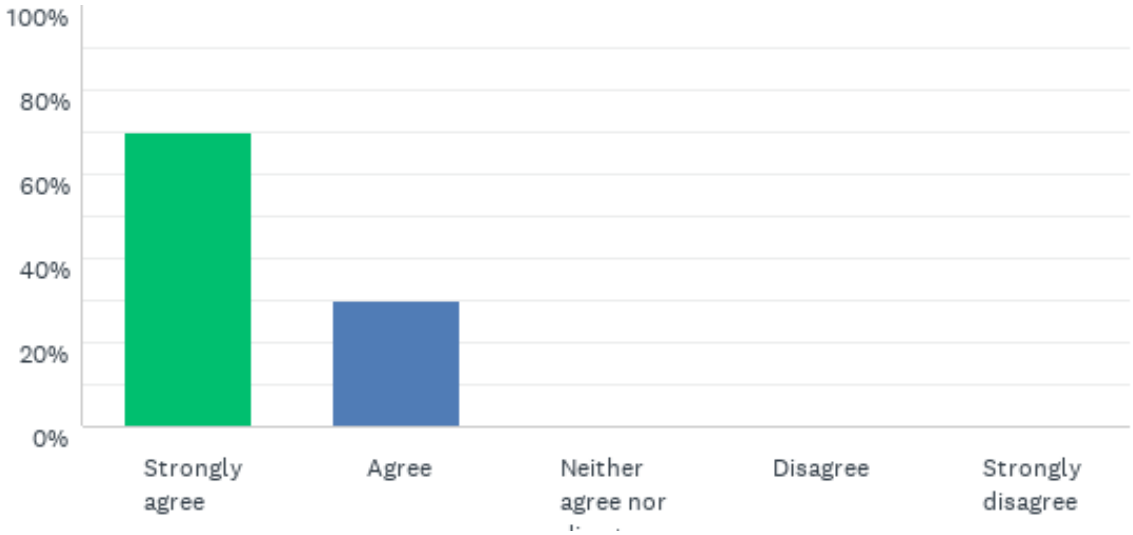
Q1: You can attain the recommended daily intake of essential nutrients on a plant-based diet (i.e. protein, amino acids, omega-3 fatty acids, b12, calcium, iron)?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	90.00%	9
Agree (2)	10.00%	1
Neither agree nor disagree (3)	0.00%	0
Disagree (4)	0.00%	0
Strongly disagree (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	2.00	1.00	1.10	0.30

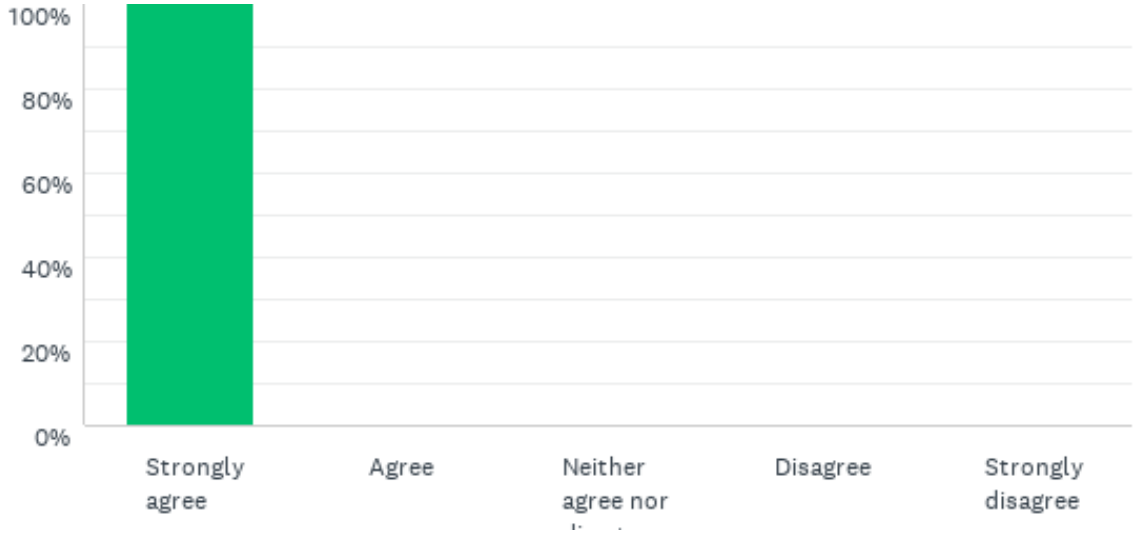
Q2: Certain plant-based foods (such as white breads, coconut oil, or fruit juices) can increase an individual's risk for developing cardiovascular disease (CVD)?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	70.00%	7
Agree (2)	30.00%	3
Neither agree nor disagree (3)	0.00%	0
Disagree (4)	0.00%	0
Strongly disagree (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	2.00	1.00	1.30	0.46

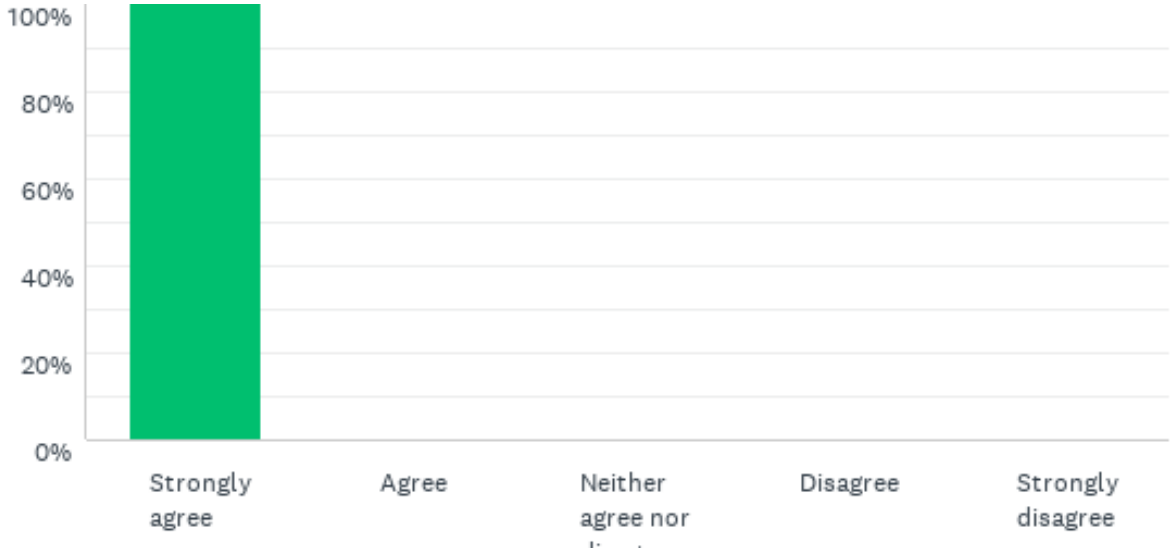
Q3: Higher intakes of plant proteins can decrease an individual's risk for developing CVD?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	100.00%	10
Agree (2)	0.00%	0
Neither agree nor disagree (3)	0.00%	0
Disagree (4)	0.00%	0
Strongly disagree (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	1.00	1.00	1.00	0.00

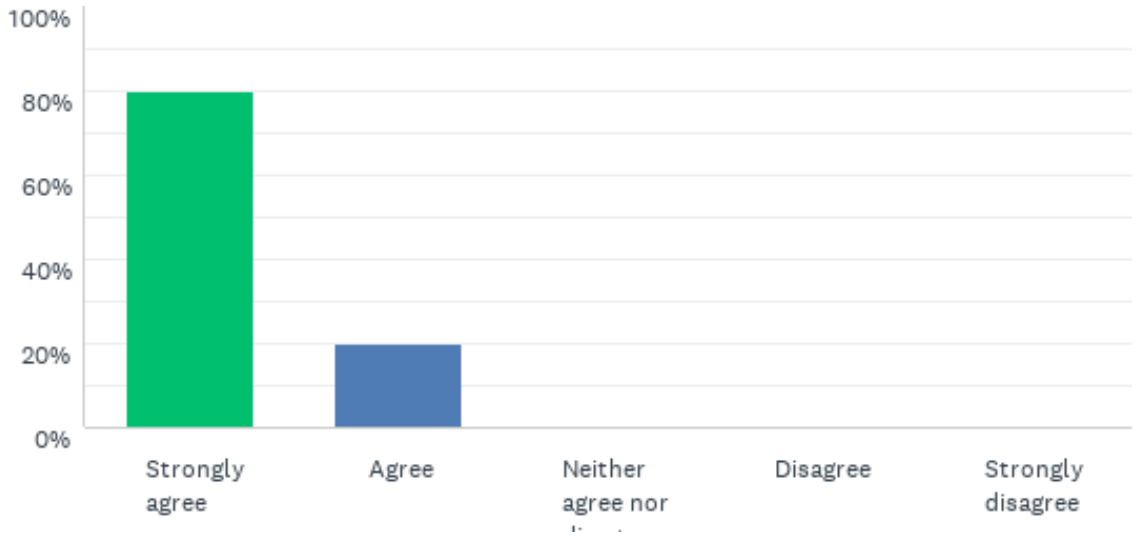
Q4: A plant-based diet can prevent or reduce the risk for developing CVD?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	100.00%	10
Agree (2)	0.00%	0
Neither agree nor disagree (3)	0.00%	0
Disagree (4)	0.00%	0
Strongly disagree (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	1.00	1.00	1.00	0.00

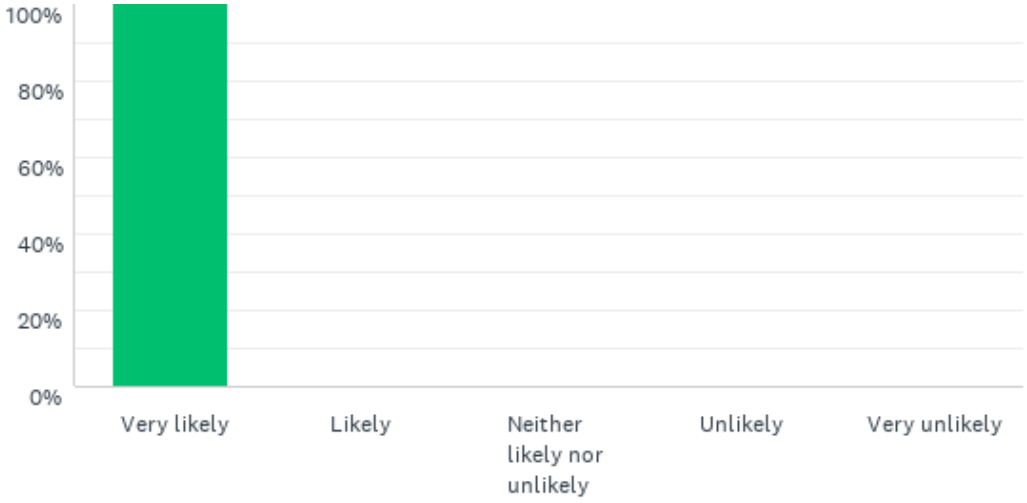
Q5: I have gained knowledge of the health benefits from a plant-based diet and its association with CVD, that I did not know prior to this project?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	80.00%	8
Agree (2)	20.00%	2
Neither agree nor disagree (3)	0.00%	0
Disagree (4)	0.00%	0
Strongly disagree (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	2.00	1.00	1.20	0.40

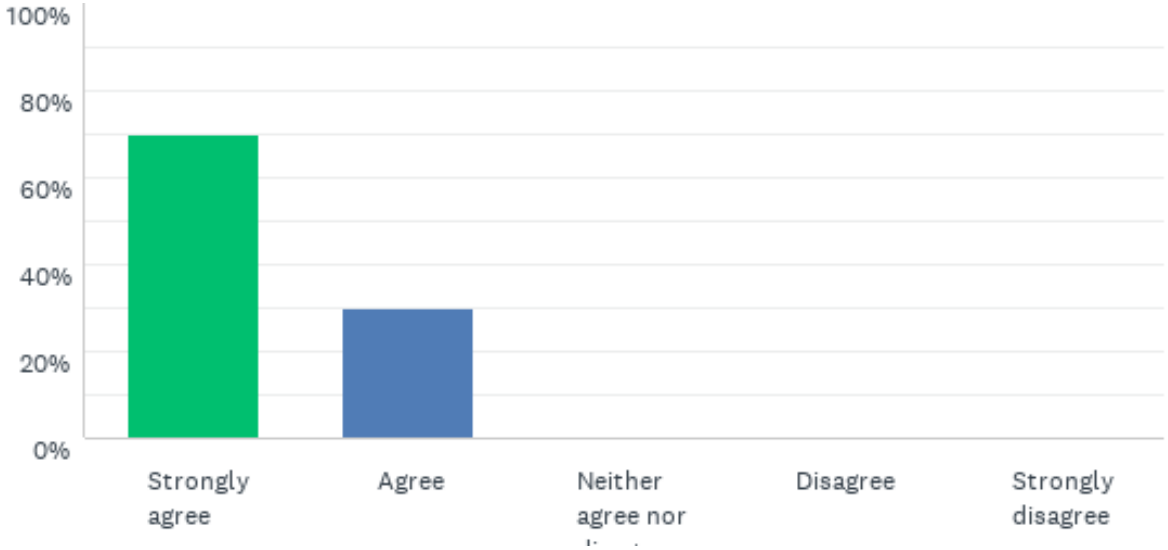
Q6: How likely are you to recommend a plant-based diet to your patients who are at risk for or with established CVD?



ANSWER CHOICES	RESPONSES	
Very likely (1)	100.00%	10
Likely (2)	0.00%	0
Neither likely nor unlikely (3)	0.00%	0
Unlikely (4)	0.00%	0
Very unlikely (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	1.00	1.00	1.00	0.00

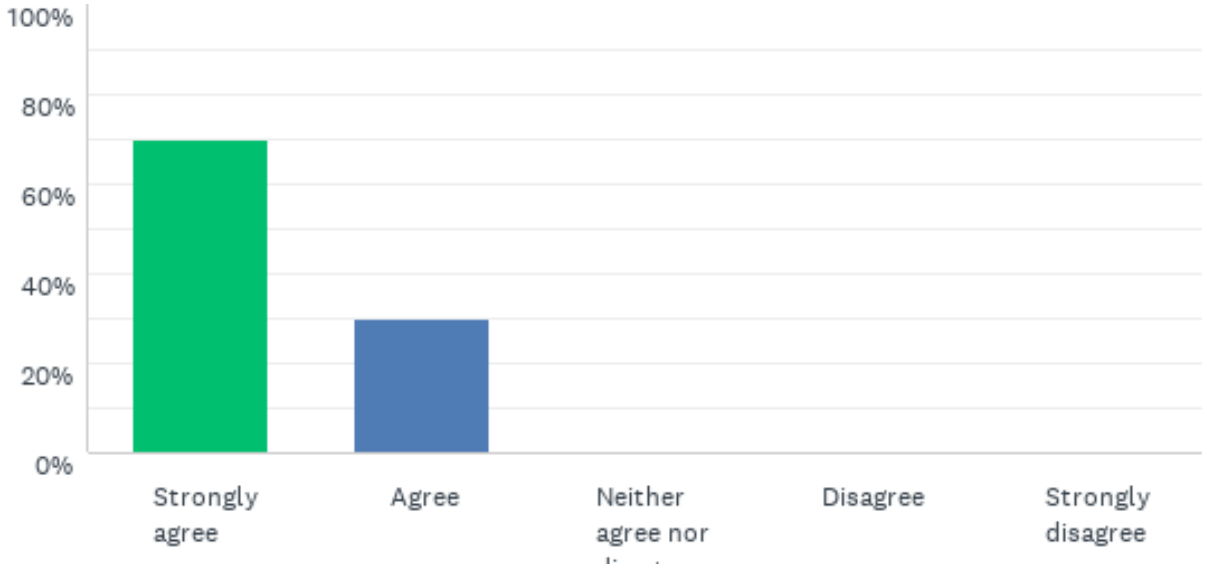
Q7: I would consider implementing a plant-based diet education/ nutrition program into my practice?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	70.00%	7
Agree (2)	30.00%	3
Neither agree nor disagree (3)	0.00%	0
Disagree (4)	0.00%	0
Strongly disagree (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	2.00	1.00	1.30	0.46

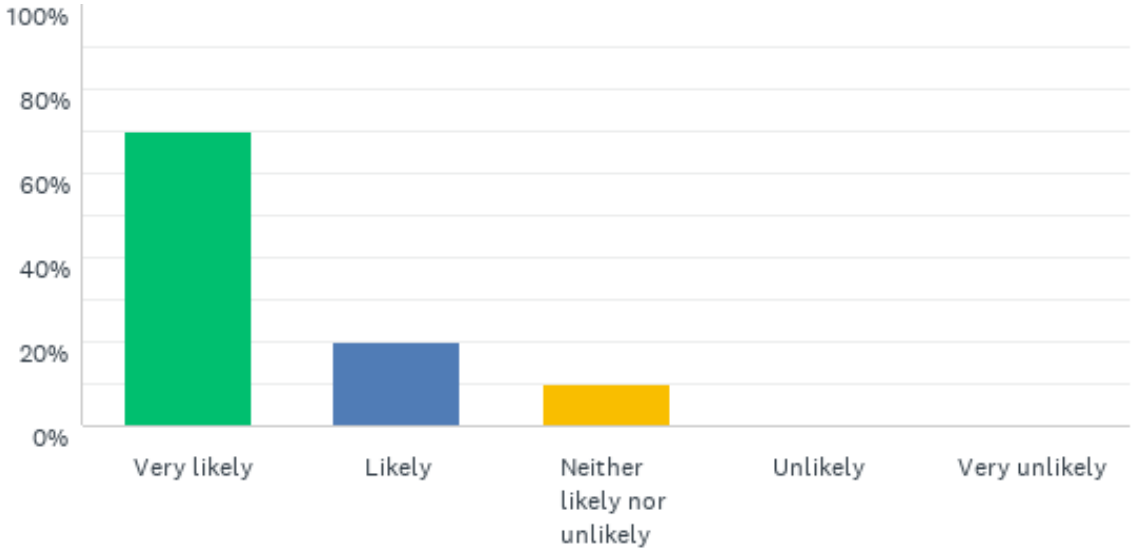
Q8: The information provided in the PowerPoint lecture is valuable for my practice?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	70.00%	7
Agree (2)	30.00%	3
Neither agree nor disagree (3)	0.00%	0
Disagree (4)	0.00%	0
Strongly disagree (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	2.00	1.00	1.30	0.46

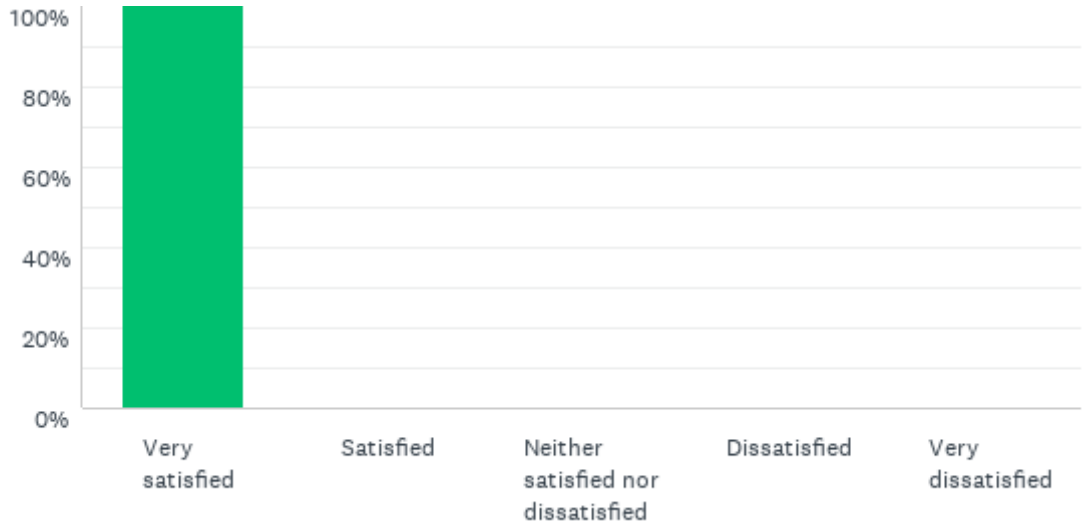
Q9: How likely will you use the included patient and provider resources in your practice?



ANSWER CHOICES	RESPONSES	
Very likely (1)	70.00%	7
Likely (2)	20.00%	2
Neither likely nor unlikely (3)	10.00%	1
Unlikely (4)	0.00%	0
Very unlikely (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	3.00	1.00	1.40	0.66

Q10: Overall, how satisfied are you with the web-based educational toolkit (i.e. lecture, resources, ease of use)

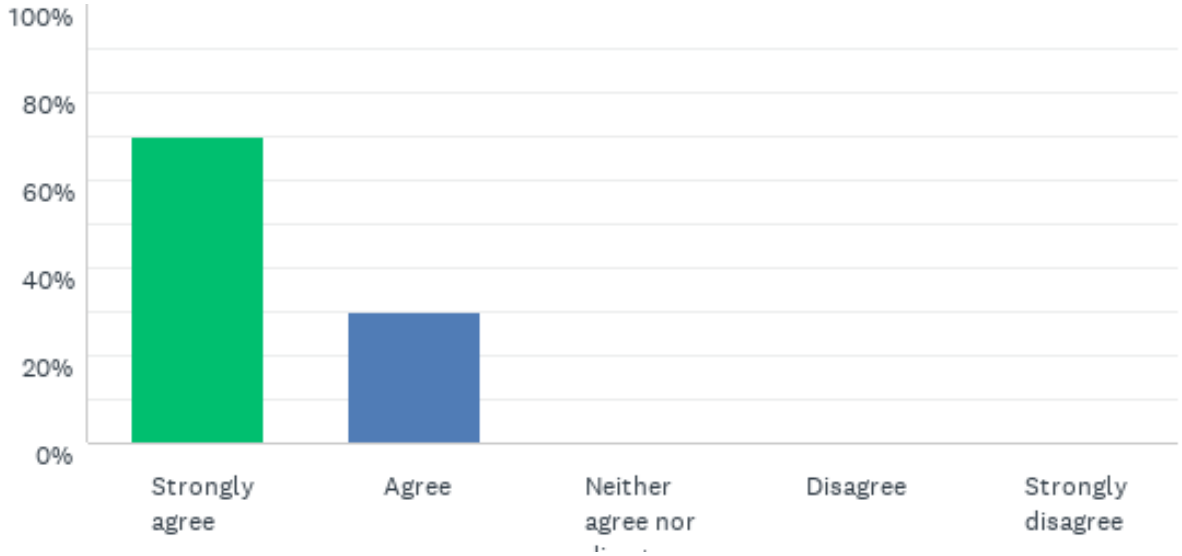


ANSWER CHOICES	RESPONSES	
Very satisfied (1)	100.00%	10
Satisfied (2)	0.00%	0
Neither satisfied nor dissatisfied (3)	0.00%	0
Dissatisfied (4)	0.00%	0
Very dissatisfied (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	1.00	1.00	1.00	0.00

Follow-up Toolkit Survey: Responses

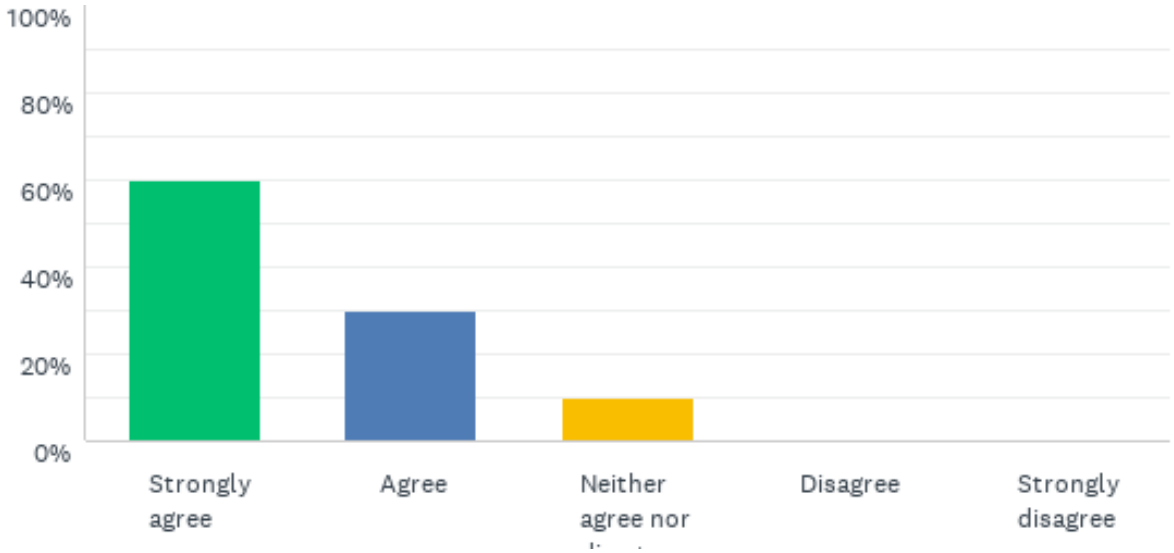
Q1: I recommend a predominantly plant-based diet to my patients at risk for or with established cardiovascular disease (CVD)?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	70.00%	7
Agree (2)	30.00%	3
Neither agree nor disagree (3)	0.00%	0
Disagree (4)	0.00%	0
Strongly disagree (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	2.00	1.00	1.30	0.46

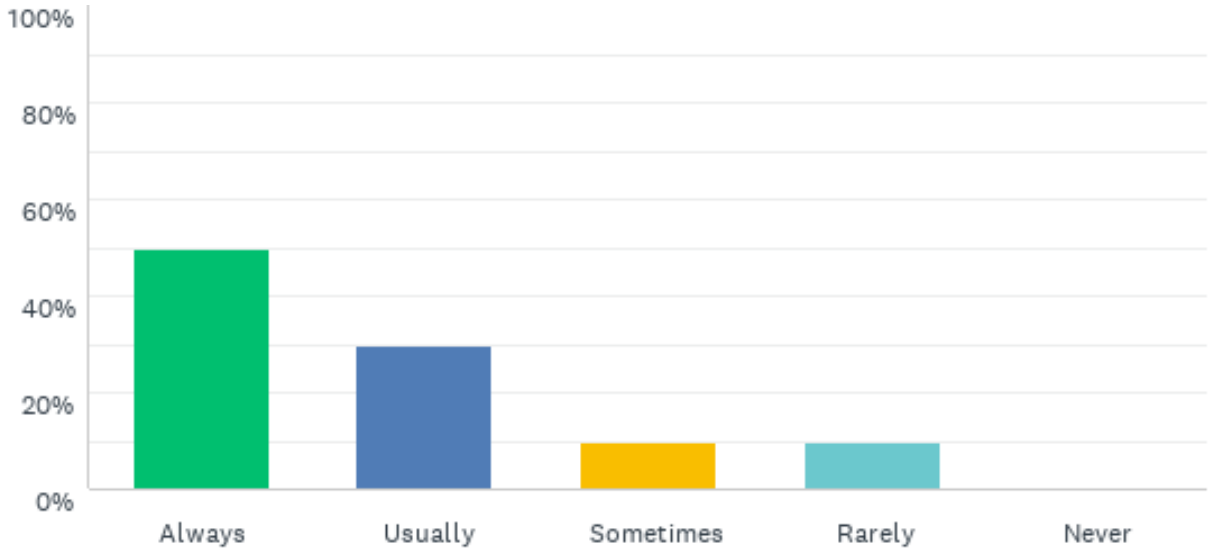
Q2: I have gained knowledge of the health benefits of a plant-based diet and its association with CVD, that I did not know prior to this project?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	60.00%	6
Agree (2)	30.00%	3
Neither agree nor disagree (3)	10.00%	1
Disagree (4)	0.00%	0
Strongly disagree (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	3.00	1.00	1.50	0.67

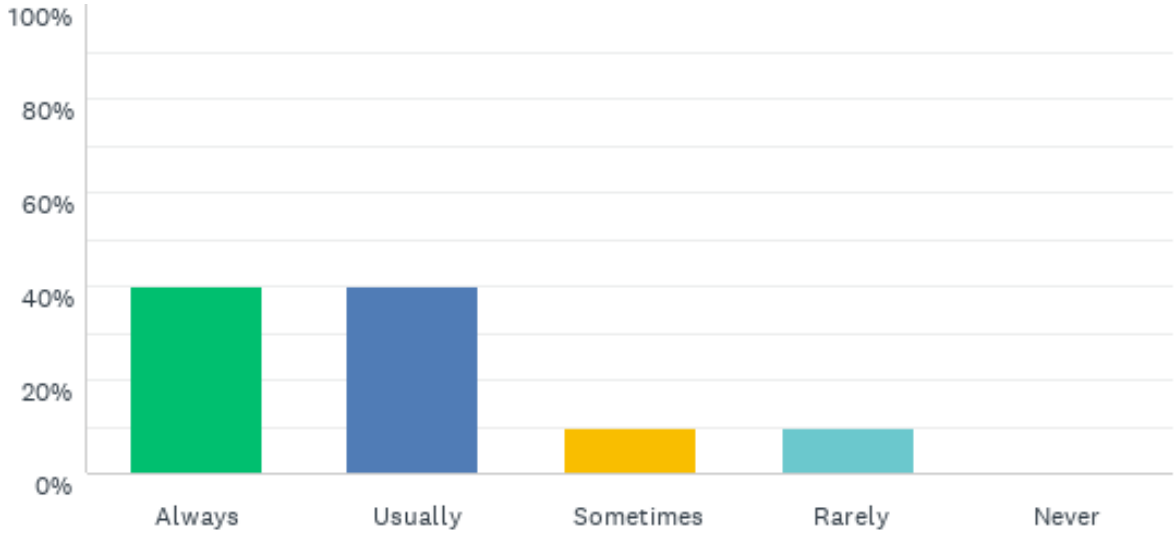
Q3: I provide my patients with the patient resources from the project toolkit who are interested in a plant-based diet or who are at risk for cardiovascular disease?



ANSWER CHOICES	RESPONSES	
Always (1)	50.00%	5
Usually (2)	30.00%	3
Sometimes (3)	10.00%	1
Rarely (4)	10.00%	1
Never (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	4.00	1.50	1.80	0.98

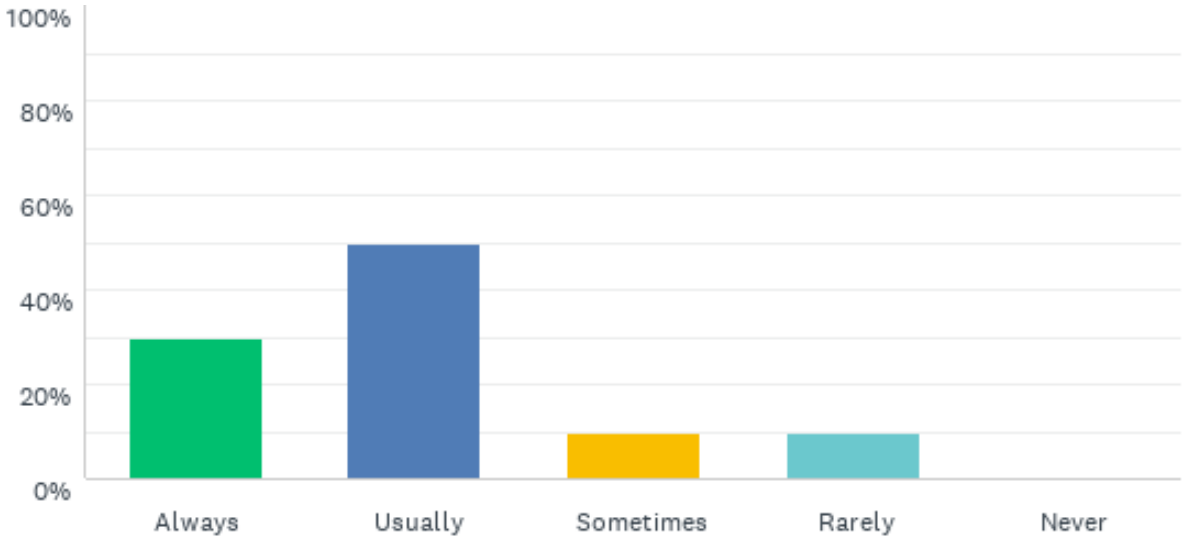
Q4: I utilize the provider resources (at least one) included in the project toolkit?



ANSWER CHOICES	RESPONSES	
Always (1)	40.00%	4
Usually (2)	40.00%	4
Sometimes (3)	10.00%	1
Rarely (4)	10.00%	1
Never (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	4.00	2.00	1.90	0.94

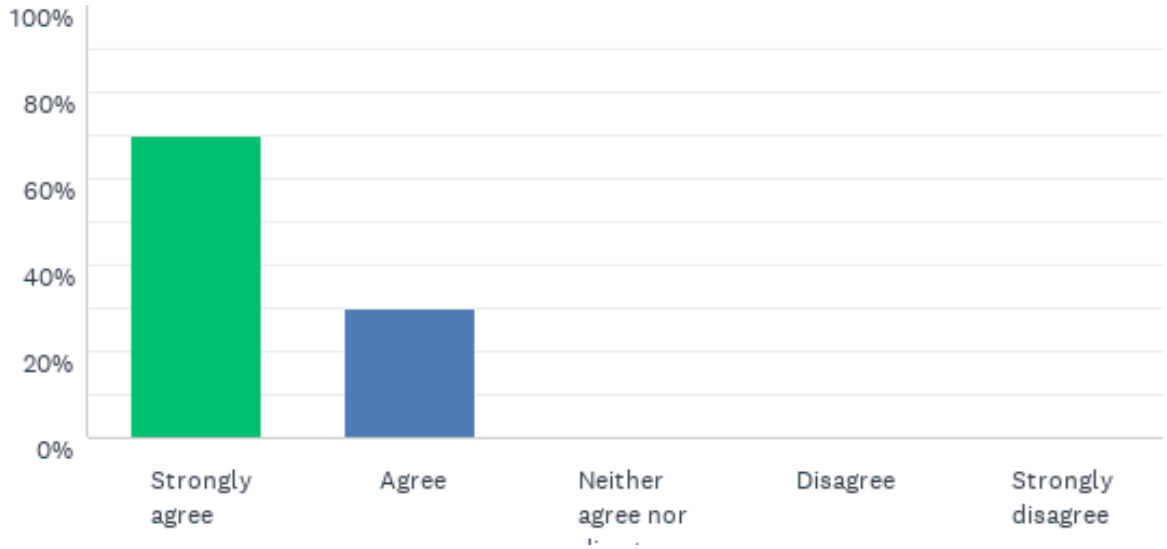
Q5: I have been utilizing the resources from the project toolkit since participating in this project?



ANSWER CHOICES	RESPONSES	
Always (1)	30.00%	3
Usually (2)	50.00%	5
Sometimes (3)	10.00%	1
Rarely (4)	10.00%	1
Never (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	4.00	2.00	2.00	0.89

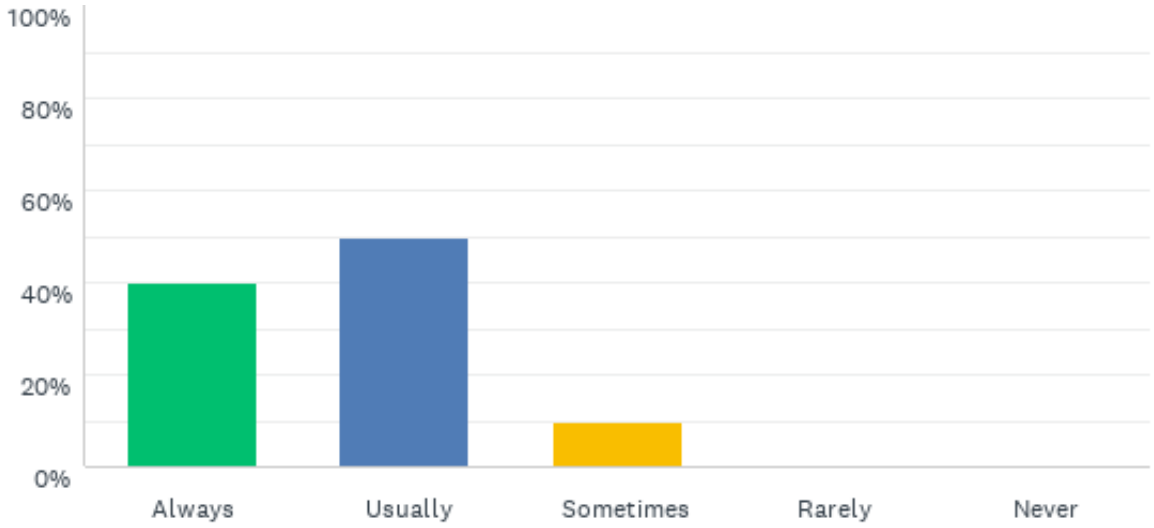
Q6: I find the project resources useful in implementing plant-based diet education into my practice?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	70.00%	7
Agree (2)	30.00%	3
Neither agree nor disagree (3)	0.00%	0
Disagree (4)	0.00%	0
Strongly disagree (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	2.00	1.00	1.30	0.46

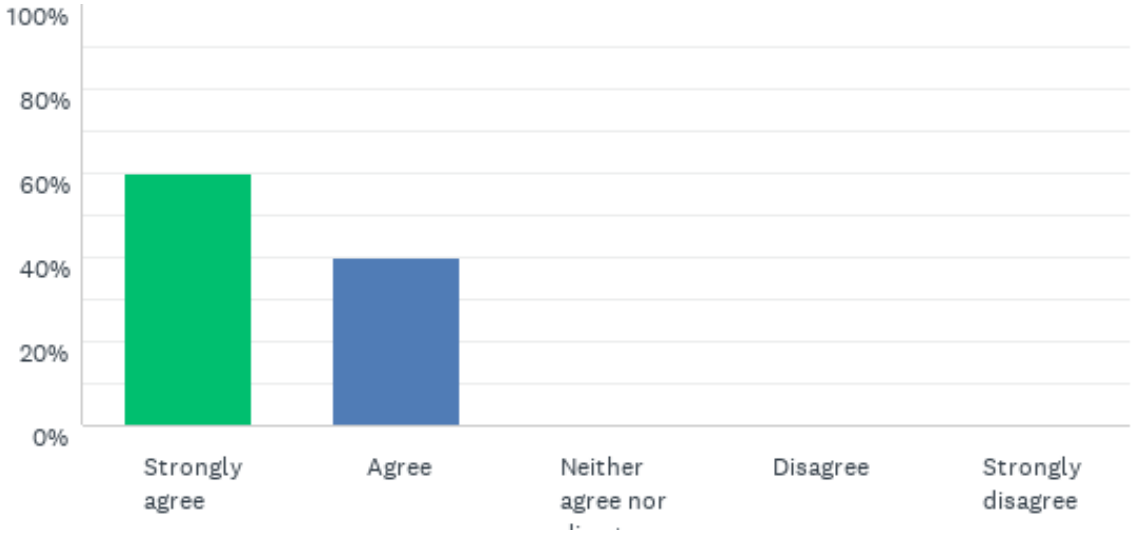
Q7: I have implemented plant-based diet education into my practice?



ANSWER CHOICES	RESPONSES	
Always (1)	40.00%	4
Usually (2)	50.00%	5
Sometimes (3)	10.00%	1
Rarely (4)	0.00%	0
Never (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	3.00	2.00	1.70	0.64

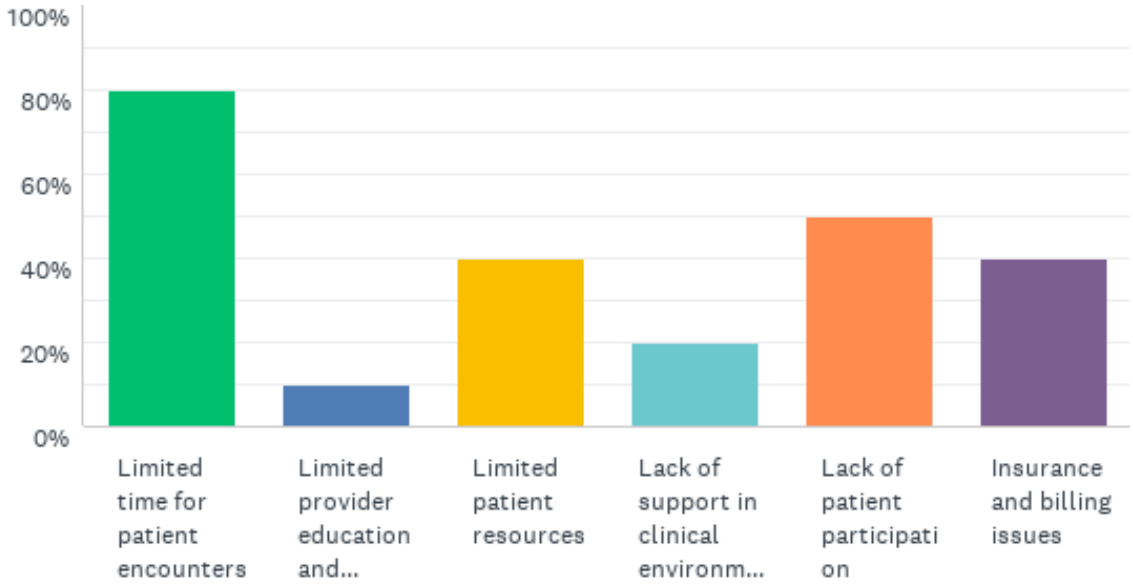
Q8: I include plant-based diet education into my practice more than I did prior to participating in this project?



ANSWER CHOICES	RESPONSES	
Strongly agree (1)	60.00%	6
Agree (2)	40.00%	4
Neither agree nor disagree (3)	0.00%	0
Disagree (4)	0.00%	0
Strongly disagree (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	2.00	1.00	1.40	0.49

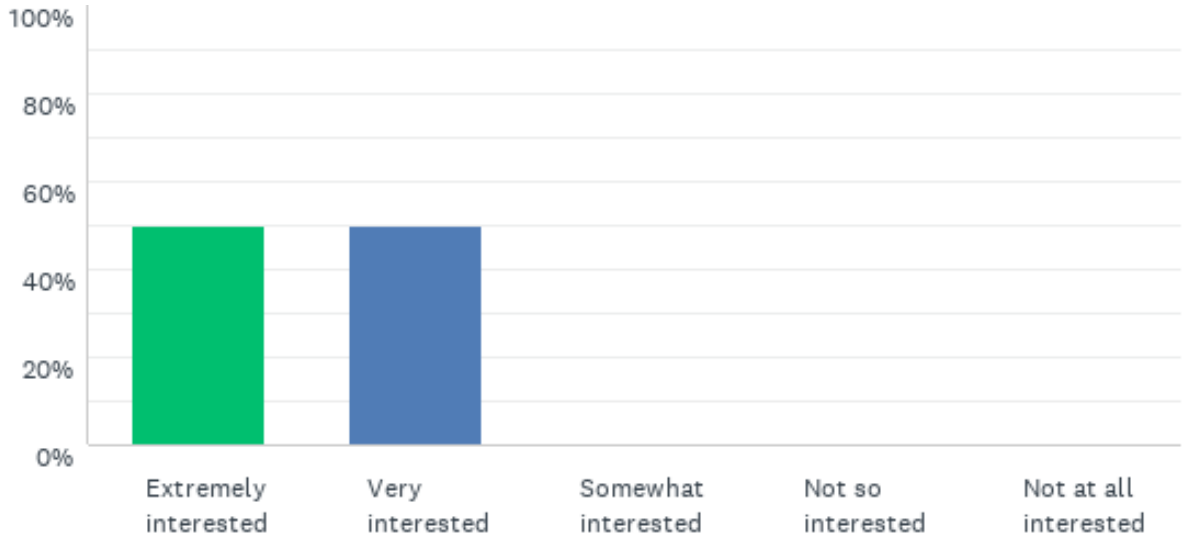
Q9: Do you encounter any barriers that may interfere with patient education on primary prevention of CVD, including nutrition? (Select all that apply).



ANSWER CHOICES	RESPONSES	
Limited time for patient encounters (1)	80.00%	8
Limited provider education and resources (2)	10.00%	1
Limited patient resources (3)	40.00%	4
Lack of support in clinical environment (4)	20.00%	2
Lack of patient participation (5)	50.00%	5
Insurance and billing issues (6)	40.00%	4
Total Respondents: 10		

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	6.00	3.00	3.29	1.93

Q10: How interested are you in learning more about a plant-based nutrition and how to implement it into your practice?



ANSWER CHOICES	RESPONSES	
Extremely interested (1)	50.00%	5
Very interested (2)	50.00%	5
Somewhat interested (3)	0.00%	0
Not so interested (4)	0.00%	0
Not at all interested (5)	0.00%	0
TOTAL		10

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	2.00	1.50	1.50	0.50